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The Value of Research.

AT a recent engineering meeting a very well-known engineer stated that while he preferred to use "safe" steam pressure and superheat, he considered that manufacturers should continue to experiment under more extreme conditions. This attitude is fairly common in the engineering world, and it has been met by many manufacturers stating that they will not do work of an advanced nature, they being prepared to leave it to foreigners. When the foreigner has done the necessary research work many English manufacturers are prepared to pay a royalty rather than do the work themselves. The result of this policy has been disastrous. Nearly all modern Diesel engines made in this country are primarily of foreign design and built subject to royalties, and similarly nearly all the steam turbines built in this country, except those of Messrs. C. A. Parsons & Co., Ltd., are of foreign origin. Similarly, we are indebted to the other nations for the gasfilled lamp (although argon was discovered in England) and for a host of other things. Even artificial silk, which originated from the researches of Sir Joseph Swan, is largely built on foreign research work. As a recent example we have the Ruths steam accumulator, which is now introduced from abroad, although the idea was initiated by Halpin many years ago, and subsequently dropped owing to lack of research.

The future promises to supply even more glaring instances of the folly of failing to contribute to research work in this country. We have the recent invention of the use of hydrogen inside turbo-generators; the hydrogen gas in the generator offers less windage resistance, and is apparently a better cooling medium and allows of a perceptible increase in output being obtained from a generator. Probably we will be asked to pay heavy royalties for this also.

Many users apparently have not grasped the enormous benefits of research from their own standpoint. In years gone by it was customary for manufacturers to

sell new designs of plant and to leave it to the purchasers to try them out and find out whether they would work or not. The result was that many people found themselves saddled with expensive plant which was quite useless, and which had to be scrapped after expensive and troublesome experiment. It is the business of research to overcome these troubles before the plant is delivered. Where there has been adequate research, the purchaser may buy extra-high-pressure boilers with steam superheated to an extreme degree, and he may be certain that the whole apparatus will stand up to the work, and that there will be no explosion of steam pipes or other unfortunate accidents. He may also buy oil switches which will clear short circuits on extra-high-pressure mains without blowing to pieces, insulators for overhead mains which will not let them down, and underground cables which will carry their load without failure. Surely it is worth while contributing liberally to research work beforehand rather than having to endure the trouble and expense of installing plant which breaks down at all kinds of inconvenient times. It is of no use to claim that the whole of the research work must be paid for by manufacturers; the benefits of research are enormously more valuable to users than to the manufacturers, and the user should be prepared to pay his full share of the cost. Some of the large works in America apparently pay as much as £100,000 a year towards research, and the profits they make out of it are gigantic.

Some very important figures were given at a recent conference held in London on the future finances of the E.R.A. It was then pointed out that the estimated saving in a 100,000-kVA station due to research on turbine nozzles was £6,000 per annum. Furthermore, Mr. Ll. B. Atkinson stated that it was estimated that the country spent £1,000,000 a year on repairing breakdowns owing to faulty insulation, and it seems quite possible to save £250,000 on that item by research. Mr. Atkinson estimated that present and future research could quite easily bring about a saving of £750,000 per annum to the electrical industry, whereas the total subscriptions paid by the industry amount to less than £4,000 per annum!

We pride ourselves on being a practical nation, but one may doubt if there is much practicality in a nation which cannot afford more than £4,000 a year to save £750,000, while it can raise a million pounds quite easily for greyhound racing. That is not the way towards future prosperity! Research work is not an expense, but an investment which produces a return beyond the dreams of avarice.

Everyone should read the report on the future finances of the E.R.A. issued by the British Electrical and Allied Industries Research Association, and after reading it they should do what they can to help this creator of national wealth.

Chinese Apprentices and British Trade.

WE have received from Hong Kong some printed communications respecting the Chinese Indemnity and the financial needs of the University of Hong Kong. The funds on deposit in the Hong Kong and Shanghai Bank to the account of the Boxer Indemnity are stated to be ample for meeting all the needs of the University and for starting it on a career of increased usefulness. An appeal is therefore made to the British Government and people, in one of these pamphlets, not to miss the opportunity now open to them of enabling the only British University in the Far East to increase its activities and to enlarge its student roll. It is described as a dangerous delusion to suppose that the British can ignore the younger generation in China and yet retain their influence in the Far East; and an even more dangerous delusion, the writer says, is for the British people to think that the University can be "allowed to sink into inefficiency and insignificance without the already diminished prestige of Great Britain in China suffering still further mortification." An accompanying leaflet dwells upon a closely related subject which has been considered here time and time again, namely, the placing of Chinese apprentices in Great Britain as a factor in the future of British trade in China. The United States, by remitting the Indemnity, has been enabled to institute an annual fund in China, part of which is spent on sending young Chinese to work in factories in America. It is pointed out that until quite recently practically all British manufacturers required a premium of several hundred pounds, but now "most firms will take a sufficiently educated and presentable apprentice and pay him a bare living wage (about 30s. to 50s. a week). The writer says that if the University of Hong Kong were provided with a system of scholarships sufficient to cover the fare to Great Britain and back, and to provide a small sum for clothes and eventualities, the Engineering Faculty could easily send to British factories a number of Chinese who would be well equipped, both educationally and otherwise, to take their places as apprentices alongside British youths. "The apprentice who has returned to China is the best and, indeed, in many cases the only possible traveller for the goods of the firm which trained him." Of course, Chinese apprentices have been trained in British factories already, but only on a very small scale, and America "has established a considerable lead." The present period of prosperity in the British electrical industry is used as one reason why our manufacturers should be studying the question as part of their plans for finding new markets.

Reverting to the 1926 scheme submitted by the University, that the Indemnity should in part be used to establish a system of scholarships tenable by its ex-students in Great Britain, the leaflet refers to the benefits that would accrue both to Britain and to China if a few scholarships of £300 each could be placed at the command of the Faculty of Engineering.

An Authorised Nuisance.

THE action brought against the Manchester Corporation, which is reported elsewhere in this issue, is of more than ordinary interest, the circumstances being peculiar in that this, we believe, is the first instance of a claim for damages due, not to smoke, but to sulphurous fumes. It was admitted in evidence that the trouble was not due to black smoke; the process of combustion at the Barton electricity works is very complete, and the plant as a whole is classed as one of the three most efficient generating stations in the world. The nuisance, the existence of which was candidly admitted by the Corporation, is due to the simple fact that a station which consumes 550 tons of coal daily must necessarily discharge about eleven tons of sulphur into the atmosphere every day, no matter what measures are taken to ensure that combustion is perfect. Mechanical methods of alleviating the mischief done by the fumes to crops and gardens, such as increasing the height of the chimneys, or the velocity of the gases issuing therefrom, are ineffective. The defendant Corporation claimed that a generating station was necessarily a nuisance, and that the nuisance was sanctioned by the Act of 1914 which authorised the erection and operation of the Barton station; the Court endorsed that view and gave judgment for the Corporation, without, however, awarding costs against the plaintiff.

It is unfortunate that in this instance the operation of a "public utility" service has resulted in material injury to an individual, who appears to have no remedy in law; is not this a case in which the Corporation should make an *ex gratia* payment to the aggrieved farmer by way of compensation for the continuing loss that he has sustained?

A Railway Signalling Scheme.

In the new colour-light signalling installation adopted for the London Bridge area of the Southern Railway, 13 mechanical frames have been replaced by two operated electrically.

OF the many important developments that have recently taken place on the Southern Railway, particularly in the London and suburban districts, not the least is the colour-light signalling installation which has been put in for the Borough Market-Spa Road line on the eastern section and the London Bridge-Bricklayers' Arms and Old Kent Road lines on the central section. The whole area in question has been track circuited, and the installation embodies a total of 201 track circuits. The scheme also provides for the electrical operation of all the points in the area, and 137 motor-driven machines have been put in for operating 147 sets of points. The equipment was supplied by the Westinghouse Brake & Saxby Signal Co., Ltd., whose system of electrical signalling has been adopted.

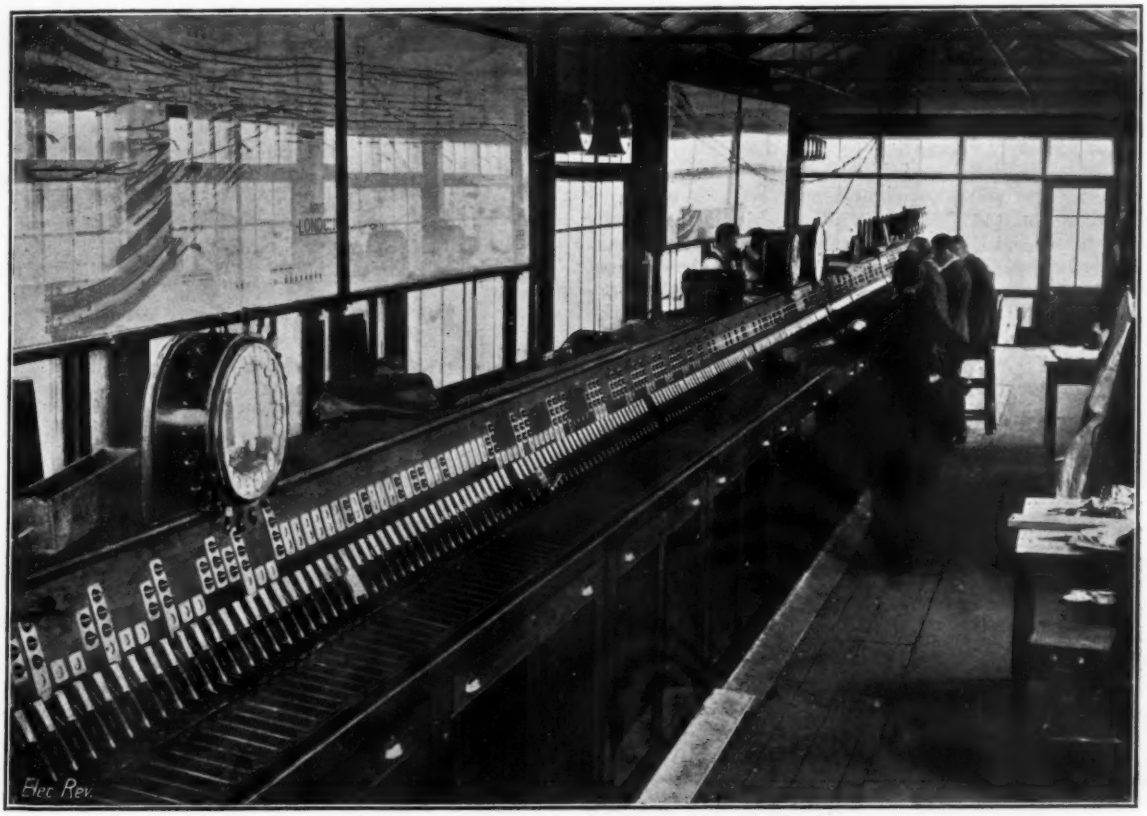


Fig. 1.—Power Frame at London Bridge—311 Levers.

There are in all 47 four-aspect, 67 three-aspect, 12 two-aspect, and 69 two-aspect shunt signals, besides 40 route indicators. Two new power frames have been established, one at London Bridge and the other at Borough Market Junction, representing a total of 346 power-operated signal and point levers, and 13 mechanical frames, embodying 748 levers, have been abolished. In addition to the running signals controlled from the signal boxes, there are 20 automatic signals on the central section between London Bridge and Bricklayers' Arms.

The 130-V d.c. supply for operating the points is obtained from duplicate 500-Ah batteries located in the signal box building, and the batteries are charged from duplicate motor-generator sets supplied from the 650-V traction rail.

For operating all the signals, point indications, lever locks, track-circuits, relays and route indicators an a.c. supply is taken from the Lewisham sub-station at 3,300 V, 75 cycles, single-phase; this is received at London Bridge, where it is transformed down to 220 V by two 25-kW transformers. At the latter pressure duplicate sets of cables take the supply to the new signal box (London Bridge), where it is further transformed down to 110 V for the operation of the relays and transmission to the track circuits. A further transformation to 12 V is carried out in the signal box in order to provide a supply for the two illuminated diagrams of the track-circuit system with which the signal cabin is equipped and also the indicating lamps behind the levers. Further, 220-V cables are also run from London Bridge to the South Bermondsey sub-station, one for the eastern side and one for the central side, and these supplies are transformed down to 110 V at suitable places for supplying the automatic signals and various outlying track circuits. The actual feeds to the track circuits are, of course, at low voltage and suitably protected transformers are installed at the necessary feeding points for this purpose. In the event of the London Bridge supply (110 V) failing, the South Bermondsey supply would take up the load, and *vice versa*.

The new signal box at London Bridge is arranged with three storeys and designed to handle about 2,400 trains per day. The power frame, fig. 1, occupies the top storey; it is equipped with 311 levers and is 64 ft. long and weighs 23 tons. Some of the levers serve for operating the points and others deal with the

actual signalling. The signals are equipped with 12-V, 24-W, double-filament lamps, so arranged as to guard against the complete failure of any signal light. The corresponding indicating lamp at the power frame is shunted across a resistance in the signal circuit and gives its full brilliancy at the two-filament loading. The failure of one filament results in a dull light at the frame end, which serves as the necessary warning.

The signalling as a whole may be described as semi-automatic, for a considerable amount of it is effected automatically and directly by the track circuits; for instance, the four-aspect signals at London Bridge provide green and double-yellow lights for "clear one and two signals ahead," respectively, which are operated merely by a train's passage over the track circuit in question. The track circuits also operate the necessary lever locks on the power frame. They are of two types, one a single-rail circuit, condenser fed; and the other a double-rail circuit, reactance fed, with resonated impedance bonds.

The two illuminated track circuit diagrams, fig. 1, are each a replica of the actual track circuits, and here again the lamps are directly operated automatically from the track circuits. A row of lamps at the bottom of each diagram serves to indicate when trains are ready to start from the platforms; the lamps are operated by the platform inspectors. A complete system of interlocking is provided between the levers, and it is particularly interesting to note that this is almost an exact replica in miniature of the system employed for the old mechanical signalling.

With the exception of the relays which serve for the automatic signalling and the first of the series of controlled signals, and also those for the track circuits over 500 yards from the box, the whole of the relays are housed in the signal box on the ground floor. The middle storey accommodates the locking and interlocking equipment, fig. 2. The locking apparatus is of the solenoid type and is supplied at 110 V a.c. The lever front-lock circuits are energised by the closing of the relay contacts for the track circuits and point detectors; the check locks on the point levers, normal

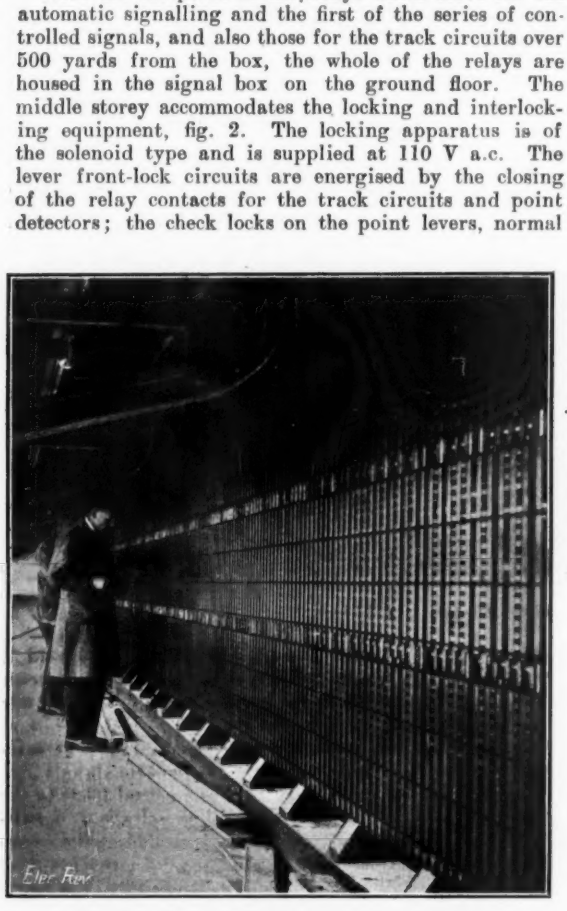


Fig. 2.—Lever Interlocking Equipment.

and reverse, are operated through track and point detector relays; the check-lock circuits on the replacing stroke of the signal levers are energised by the signal returning to danger; and the signal back locks are energised when the appropriate track circuits are clear.

The following special controls and features of the system are of particular interest. The automatic signals do not give the "clear" indication unless either the signal ahead is properly returned to danger behind the last train, or the line is clear for an appropriate

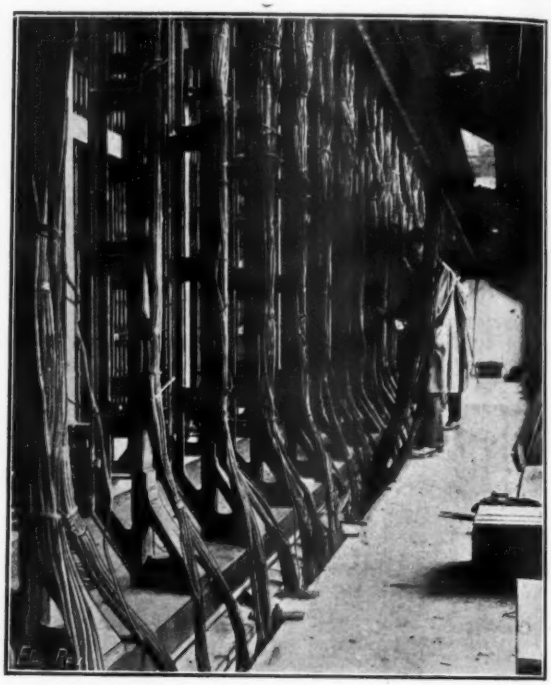


Fig. 3.—Wiring Under Power Frame.

distance ahead. When the train has approached within a pre-determined distance of a signal, the road cannot be altered until the train has passed clear of the junction ahead concerned. Wherever a speed restriction is necessary for crossover roads, &c., a signal remains at danger, even though the lever is pulled, until the train has arrived within a predetermined distance of the signal.

The whole of the work was carried out by the Signal Department of the Southern Railway, to whom great credit is due for the excellent workmanship put into the job, on account of the limited time in which the work was carried out, about six months from start to finish, and for the speedy change-over effected from the old to the new system, in something like 12 hours.

Fig. 3 shows some of the wiring below the power frame at London Bridge.

Canadian Domestic Appliance Sales.

In a recent paper Mr. G. J. Mickler, manager of appliance sales, Hydro-Electric Power Commission of Ontario, deals with the increase in the use of domestic appliances in Ontario between 1924 and 1927. He estimates that the number of electric ranges rose from 47,505 on December 31st, 1924, to 83,298 on December 31st, 1927, giving a "saturation" of 21.3 per cent. The number of washers rose from 55,342 to 92,219, a saturation of 23.5 per cent.; vacuum cleaners from 64,205 to 88,539 (22.5 per cent.); air heaters from 103,000 to 131,531 (33.4 per cent.); irons from 307,800 to 363,476 (92.8 per cent.); and toasters from 152,200 to 171,317 (44.2 per cent.). Mr. Mickler considers that the rate of growth of the percentage is too slow. He attributes this to the disputes between electrical dealers and others handling electrical appliances as a side line; to the lack of proper education among those who are actively engaged in selling the appliances; and the inadequate margin allowed to dealers by the manufacturers.

Electrical Plant in Workshops.

The Author Questions the Necessity of Numerous Interlocks and Isolating Switches.

By J. ANDERSON.

THE Home Office Regulations require that any piece of apparatus which needs inspection or repair while the supply cables are alive must be capable of complete isolation from the supply, and that the means for isolation must be as close to the apparatus concerned as is reasonably possible.

Insistence on an isolator close to the gear means that it is not sufficient to make a cable dead at the distribution centre, so that a dead feeder has to be regarded as a live one, and the regulation is being interpreted in this way by the inspectors.

The Home Office Regulations do not specifically call for interlocks, but all through they stress the necessity of preventing danger, and any interlock which can be regarded as tending to diminish personal risk may be demanded.

The Regulations regarding the use of electricity in mines do mention safeguards and interlocks, and prac tice under official pressure is gradually drifting in the direction of numerous interlocks, rendering the gear very expensive and difficult of access for ordinary repair and inspection.

Personal safety is being "secured" either by the entire absence of the gear or by the neglect of maintenance.

The common practice for small d.c. motors is to install a starter with low-volt release and open position at "off" and a separate switch and fuse. The switch serves as an isolator for the starter, but as it is subject to wear, and the fuse may need repair, an isolator is required for the switch and fuse.

The full intention of the Regulations is not ensured unless the starter is so interlocked with the switch that access to the interior is obtained only when the switch is off, and the isolator must be interlocked with the switch to prevent operation on load, otherwise an isolator would be required for the isolator.

These interlocks are not very costly or difficult to devise, provided they are arranged as reminders to prevent the operator unwittingly doing the wrong thing, but attempts to frustrate deliberate misuse are merely laborious and costly achievements of futility, because what the ingenuity of one man devises another man's ingenuity can defeat.

This simple case serves to raise the question how far so-called safeguards are really necessary.

There must be literally millions of the simple non-interlocked switch-fuse-starters in use all over the world, and viewed in the light of the experience of the past 40 years, shorn of fads and the vested interests of officialdom, the conclusion can only be that, given the most elementary knowledge of electrical gear and a modicum of care, far less than that required to cross a road in safety, there is no practical need for a profusion of safeguards.

Apart from the Regulations, all that is necessary is a simple uninterlocked switch-fuse-starter combination with a warning label in all those cases where the switch can be made dead at a distributing centre without undue cost or inconvenience caused by the stoppage of other plant and the addition of an isolator with its label in those cases where the loss of revenue due to a short shut-down is serious. A padlock on each unit effectively prevents access by unauthorised persons.

In effect, the capitalised cost of the isolator has to be placed against the cost of a possible enforced stoppage which, in the vast majority of cases, is very unlikely to occur.

If an enforced stop is rarely likely to occur on the starting gear, it is still less likely to occur on the protective gear nearer the supply, say, on the distribution board or in the sub-station.

Switches or breakers at these points are operated infrequently and are not subject to mechanical wear. They exist as isolators and as protective devices in the event of faults.

If it were possible to make an analysis of such gear, it would be found that not one half of 1 per cent. is ever called on in the whole course of its working life to interrupt excessive fault currents, and even if it were, provided it was up to B.E.S.A. standard, there would be no need to isolate it for immediate inspection. Inspection and repair could almost invariably be deferred to the end of the shift.

The B.E.S.A. specification for oil breakers reads:—

> "The circuit breaker shall interrupt its rated kVA breaking capacity twice at a two-minute interval, and then shall be in a condition to be closed and carry its rated current until it is practicable to inspect it and make necessary adjustments."

This specification calls for a very high class of gear, and it implies that the user knows the maximum possible short-circuit current at the point where the breaker is installed. There is no difficulty in ascertaining this current on existing installations, and the supply authority can easily determine the value for a proposed installation.

There may be a little difficulty to-day in extracting the information from the supply authorities, but in the very near future they will find it just as necessary to declare the maximum short-circuit current as to declare the supply voltage.

Numerous isolators are only necessary if the gear is poor or too small for the duty.

A positive interlock is essential in those cases where a mistake involving risk can occur with gear which has to be habitually operated by ignorant or careless people. A typical example is the plug on the trailing cable carrying the current to a coal-cutter. This plug has to carry currents up to 60 amperes at 500 volts; its withdrawal on load would certainly result in serious trouble, and it is therefore imperative to interlock it with the switch.

The Home Office is concerned only with personal risks, but the user has also to think of the damage to plant which may be caused by a mistake. Whether a mistake is worth preventing depends on the consequences of the mistake. For example, closing the supply to a 3-phase slip-ring motor with the starter in the wrong position merely means that 5 to 7 times full-load current passes and trips the breaker on an overload which it should be capable of tackling easily, while closing the supply to a d.c. shunt machine in similar circumstances may mean 20 to 30 times full-load current and a nasty flat on the commutator, or it may be a case of the incorrect operation of two switches causing a dead short circuit on the system.

Each case has to be considered on its merits, and the cost carefully weighed against the contingency.

There are, undoubtedly, very few cases wherein safeguards and interlocks are essential, a few where they are advisable, and some where they can be so cheaply effected by the addition of a boss or a projection, or by the orientation of the parts, that it is not worth while debating their absolute necessity. In the greater number of cases, an instruction label, a padlock, and the key in the possession of a responsible person will be found to be cheaper and more satisfactory than an interlock.

A Beet-Sugar Factory Electrical Installation.

Some impressions of a visit to the factory of the Lincolnshire Beet Sugar Co., Ltd., at Bardney, which is believed to be the most up-to-date one of its kind in England.

WHILE it seems that the fortunes of the beet-sugar industry, as far as this country is concerned, are still "in the air," it may safely be said that the industry has come to stay. It is evident that the main problems are economic rather than technical, and that the conditions of climate and soil in this country are such that the industry should be encouraged.

From the electrical point of view there is every reason to foster this comparatively new development: a few beet-sugar factories dotted about the countryside, each demanding electrical energy in the neighbourhood of, say, 1,000 h.p., might easily turn the scales commercially in favour of a rural distribution scheme. There is also, of course, the question of providing work for the electrical manufacturers, and it seems that the electric drive offers peculiar advantages in the somewhat complicated processes involved.

Some idea of the application of electricity in the industry and the extent of its use was gained during a recent visit to a large beet-sugar factory which is believed to be one of the most up-to-date works of its kind in this country—that at Bardney, near Lincoln, owned by the Lincolnshire Beet Sugar Co., Ltd., to which we were indebted for permission to view the electrical equipment and take photographs. The factory was designed by Messrs. Dyer & Co., and was built by Messrs. Sir Robert McAlpine & Sons under the supervision of Messrs. Dyers' experts.

The factory, which is capable of dealing with 1,000 tons of beet per day, was completed last autumn, just in time for its first campaign. The annual beet-sugar campaign starts at about October, when the beet is ready for harvesting, and continues as long as the supply lasts, usually about four or five months. During this period there is continuous operation, night and day, and it will be seen that it is necessary for the equipment to be kept up to concert pitch. There are some 2,200 h.p. of electric motors installed in the factory, varying in capacity from 1.5 to 160 h.p. and performing all manner of duties, including the driving of pumps, elevators, cutting machines, and so on. Normally the loading on the factory supply is about 800 kW. The factory, fig. 10, is self-contained, electrically, two 750-kW General Electric Co. alternators, 3-phase, 440-V, 50 cycles, fig. 1, directly coupled to 1,000-h.p. Browett Lindley compound 3-cylinder reciprocating engines running at 300 r.p.m., being installed. Steam is supplied from three four-drum Babcock and Wilcox water-tube boilers, with chain-grate stokers, which also supply "process" steam, and the exhaust from the engines is also fed to the factory and used in connection with the manufacture of the products. There is also a 60-h.p. Arnold Johnson petrol engine driving a 35-kW G.E.C. alternator for supplying the out-of-season motors and lighting. A 10-panel open-type polished-slate switchboard serves for the three alternators and six factory feeders, while one panel accommodates voltage-regulation equipment supplied by the British Thomson-Houston Co., Ltd. The board is also of G.E.C. manufacture. The generating pressure, 440 V, 3-phase, is used throughout the factory for power and for lighting a 3-phase, 100-V supply is obtained from a 50-kVA transformer. The whole of the lighting is arranged between phases, and a special distribution board is employed for balancing.

The beet, which is brought to the factory by rail and barge, and also locally by light railway, is received in flumes outside the building, from which it is carried by a stream of water in convenient channels into the factory proper, being washed in transit. Water for this purpose is taken from the River Witham, on the banks of which the factory stands, by means of two 160-h.p. and one 25-h.p. electrically operated pumps, fig. 4, situated in an exterior pump house. Power is supplied to these pumps by two 3-phase circuits of h.d. copper conductors, covered by v.i.r. insulation and special weather-proof compound, and carried on fir poles.

On its arrival in the factory proper, the beet is picked up by an electrically driven water-wheel, and after a final cleaning is taken to the top floor, a lift of some 50 feet, by means of paddle-type continuous vertical elevators. Fig. 5 will give some idea of the driving arrangements for the elevator. The motor has a capacity of 20 h.p., and is of the slip-ring type; it is controlled by a combined rotor and stator starter with internal resistance finger control. The elevator will deal with 75 tons of beet per hour. It is from its elevated position that the beet really enters upon the series of processes, involving slicing, diffusing, lime treatment, carbonating, crystallisation, pumping, drying, and so on, which result in the final products. We use the plural because, other than sugar, the output of the factory includes cattle foods and fertilisers, which are perhaps more important than what are generally understood as ordinary by-products. The slicing or cutting of the beet is effected by specially designed machines driven by 40-h.p. motors. Fig. 3 shows the electrical equipment at one section of the knife station. Speed variation was a problem met with in connection with the driving arrangements for the cutting machines, and it has been successfully solved by means of the tramway-type controllers shown at the back of the illustration; the resistances are positioned below the floor. The motors are of the slip-ring type, and the whole equipment is governed by oil-immersed circuit-breakers. A good example is shown in the illustration in question of the use which is made throughout the factory of flexible armouring for the end-connections at the motors and switchgear terminals. This is watertight and affords continuity throughout the tubing, motor casings, and so on.

As already indicated, pumping, from the electrical point of view, is one of the principal operations; it certainly seems to make the biggest call on the generating plant. The juice which is extracted from the beet, as juice and in its other forms resulting from the various treatments, is pumped from one process to the next, or from station to station, the whole resolving into one continuous process. An interesting section of the equipment is shown in fig. 7. It is a line of seven juice pumps, all electrically driven by motors varying from 10 to 25 h.p. These are all of the squirrel-cage type and controlled by star-delta starters (right). Fig. 2 shows a double line of pumps similarly employed; the ten motors range in capacity from 15 to 25 h.p. The smaller ones are controlled by star-delta starters, while auto-transformer equipment is employed in connection with the larger ones. The neat job made of the fixing for the starters demands attention, particularly because of its simplicity: the apparatus is carried on an angle-iron framework arranged down the centre of the gangway between the lines of motors. While on the subject of the pumping equipment, reference may be made to the sewer pump drives. It will readily be

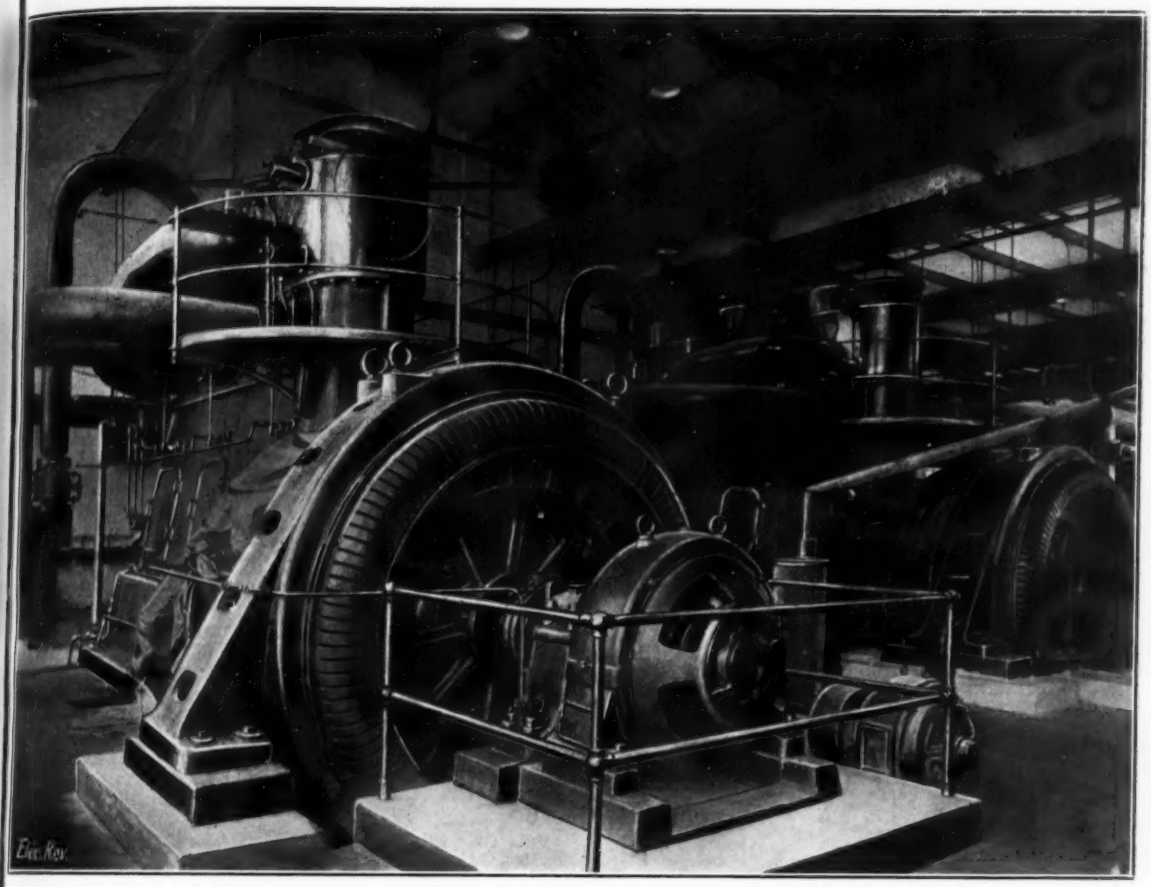


Fig. 1.—Generating Plant : Two 750-kW Sets.

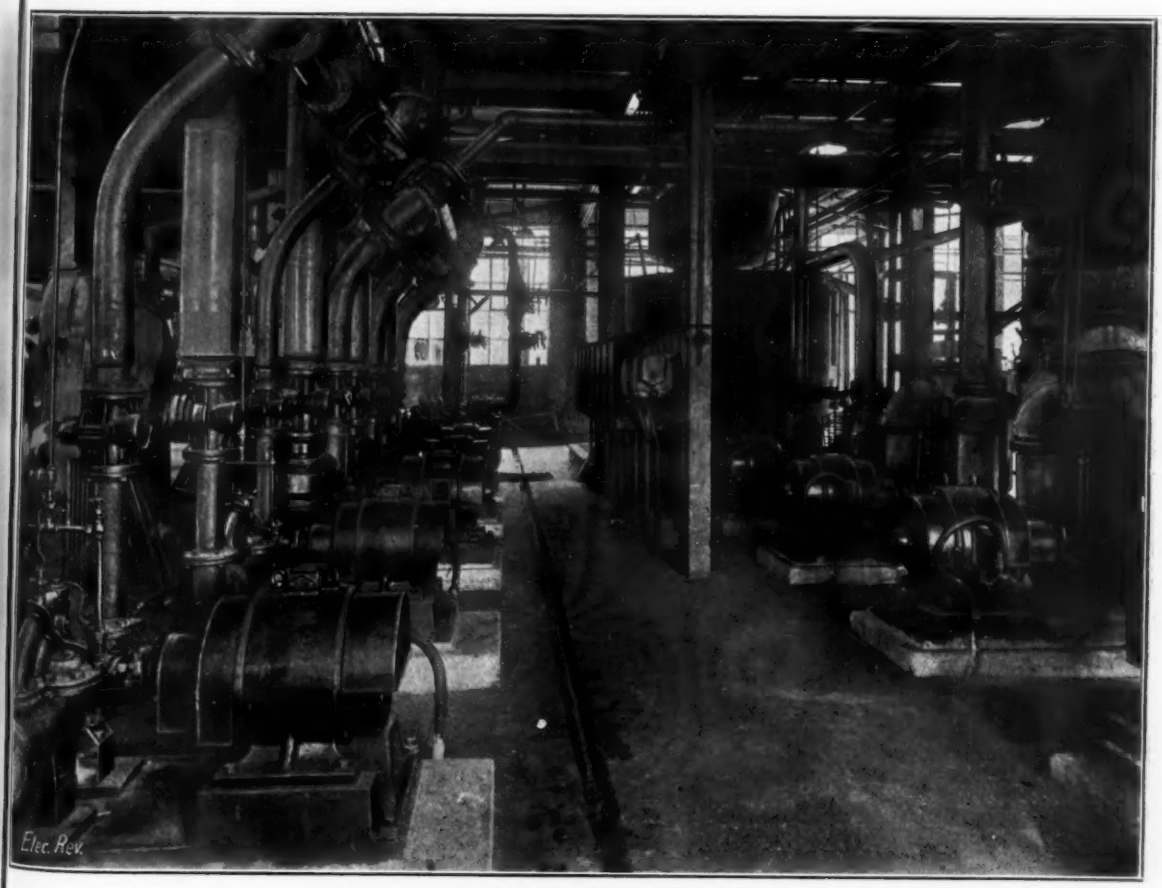


Fig. 2.—Group of Juice and Water Pumps.

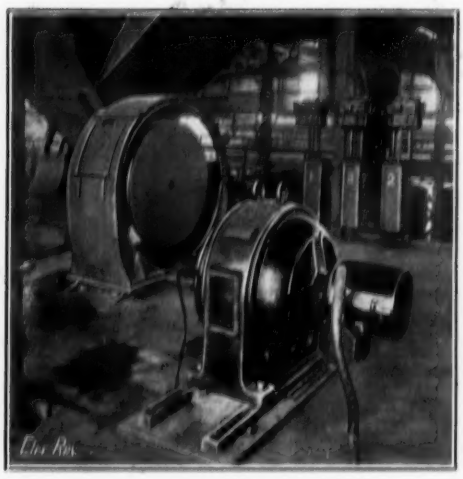


Fig. 3.—Section of Knife Station.

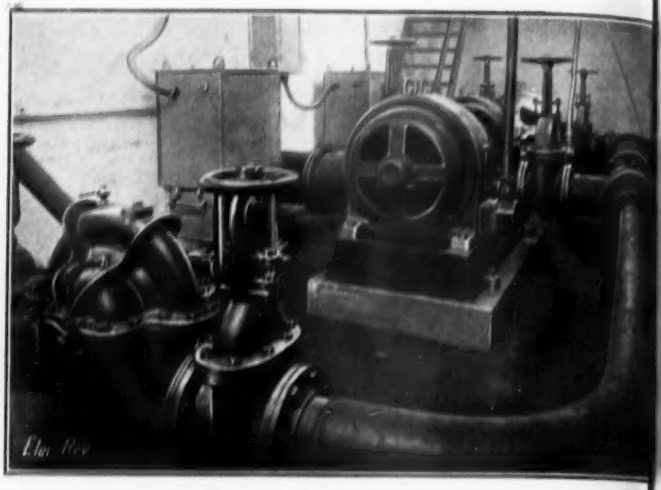


Fig. 4.—Main Pumping Equipment.

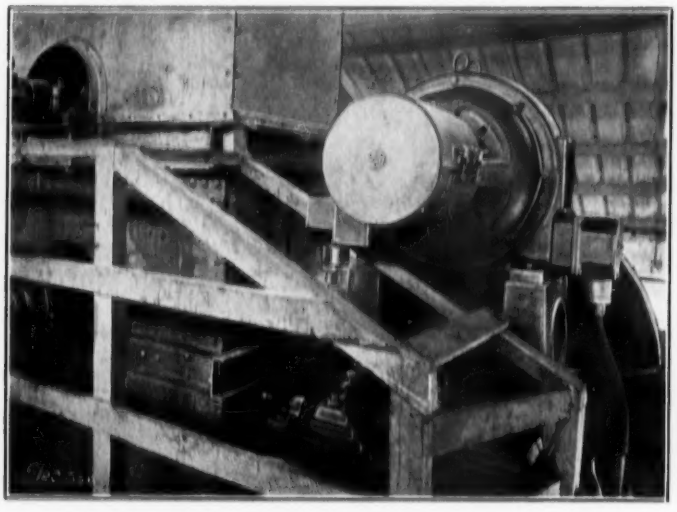


Fig. 5.—Beet Elevator Motor Drive.

Fig. 6.—Example of Factory Cabling.

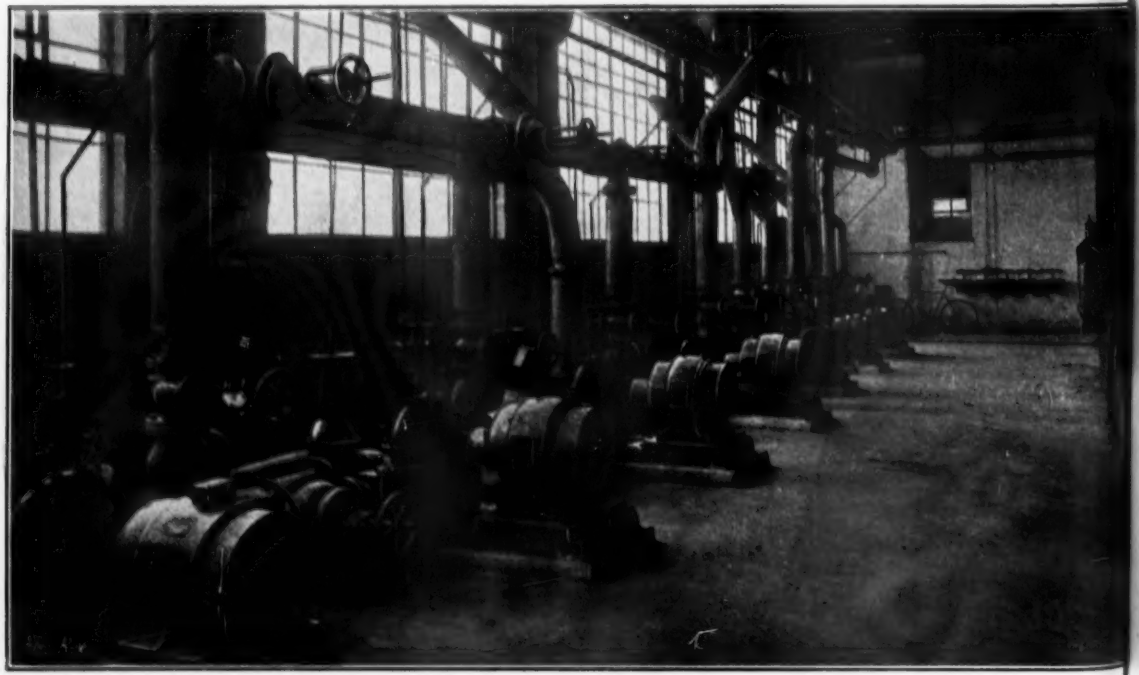


Fig. 7.—A Line of Juice Pumps.

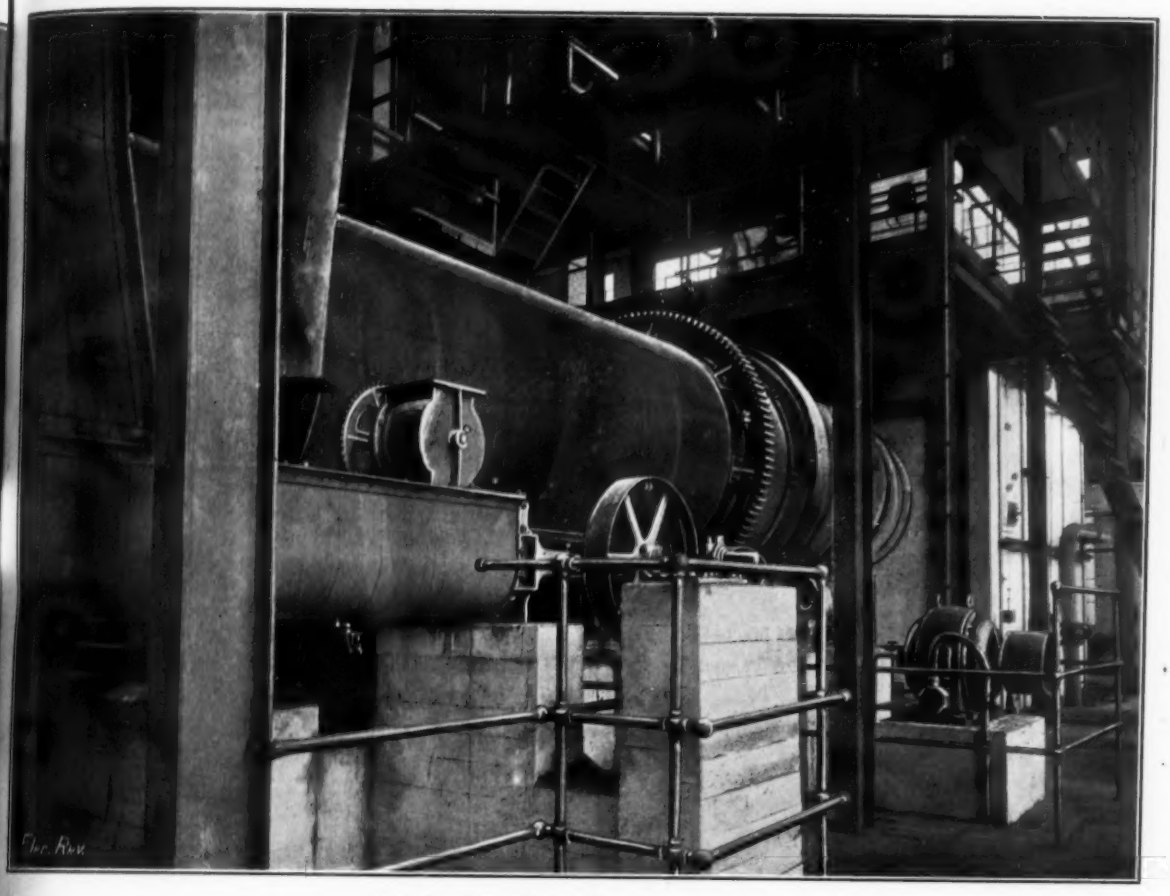


Fig. 8.—Pulp-drier Driving Arrangements.

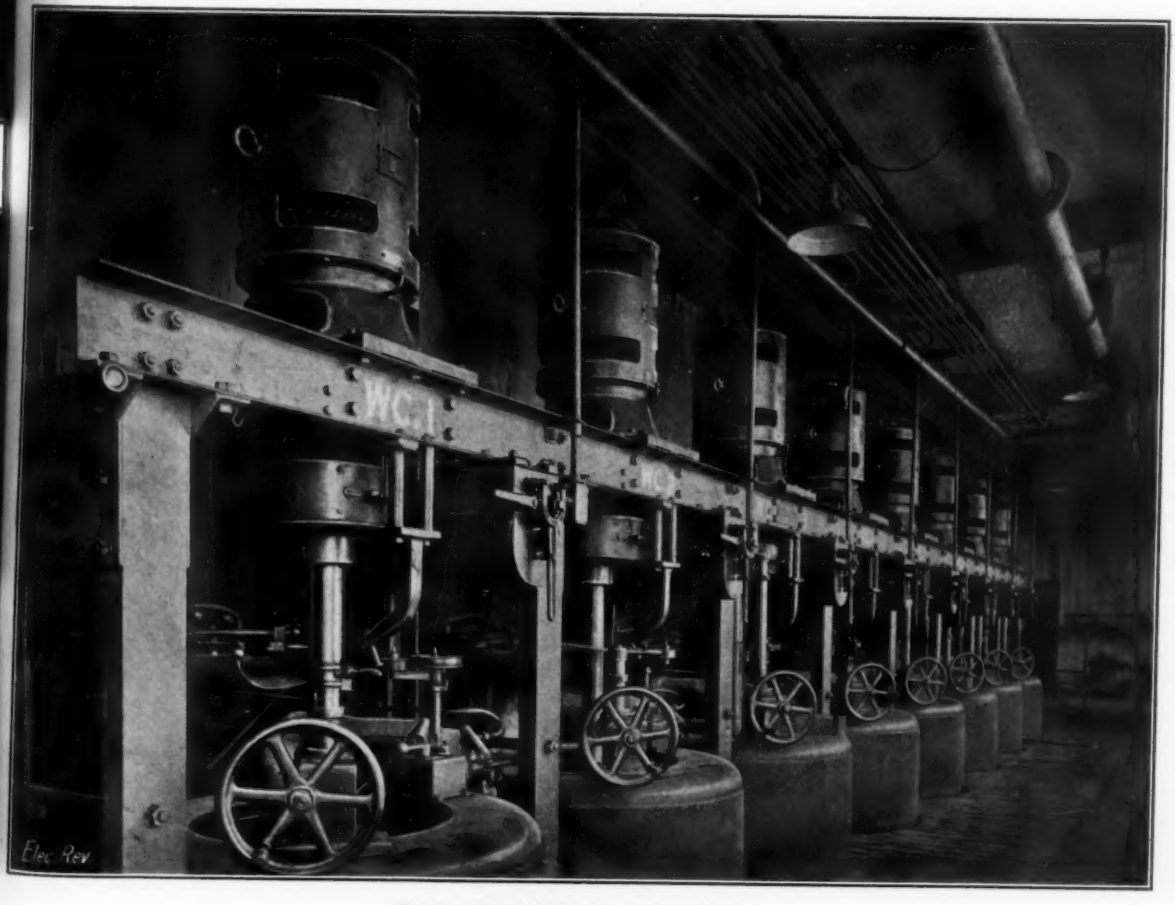


Fig. 9.—Electrically-driven Centrifuges.

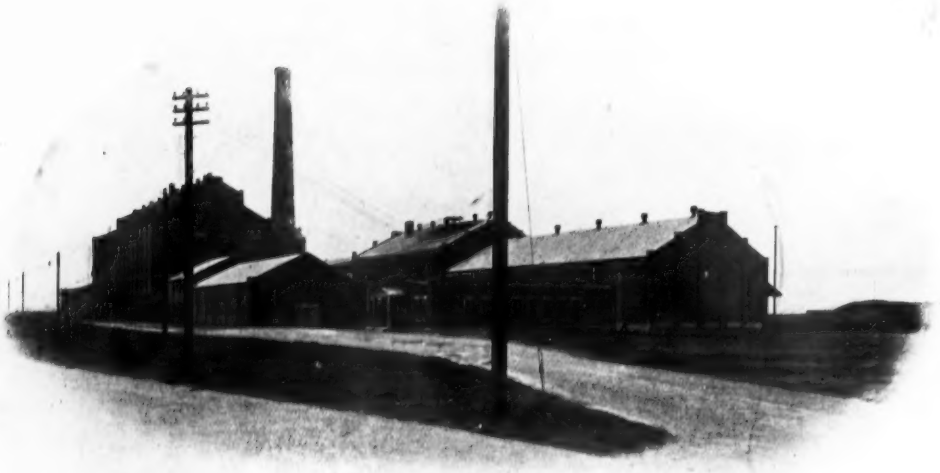


Fig. 10.—Beet-Sugar Factory, Bardney: External View.

Fig. 11.—Steam Pans, Showing Inspection Lights.

conceived that in a factory such as the one in question efficient drainage is an important factor. A group of motor-driven pumps is provided to deal with the waste liquids from the processes, which drain into a sump from which they are pumped into settling ponds before being drained back into the river. Two large pumps are driven by 70-h.p. squirrel-cage machines, while a 10-h.p. motor drives an auxiliary sewer pump. A 40-h.p. motor is installed to drive the beet wheel already referred to. The starting equipment includes auto-transformer starters for the 70-h.p. motors, rotary-resistance apparatus for the beet-wheel motor, and a star-delta starter for the small machine.

An important part of the operations is the separation of the actual sugar from the semi-liquid substance which is evolved from the various treatments. Centrifuges are used for this work and, of course, the electric drive has proved the only satisfactory solution. Fig. 9 shows one of two particularly interesting groups of centrifuge equipment. There are eight centrifuges in each group, each driven by a 20-h.p. vertical-spindle s.c. motor arranged for switching direct on to the line. The motors are double wound, so as to provide two running speeds, 500 and 1,000 r.p.m., and oil-immersed; 3-way ("off," "low," and "high") throw-over switches are provided.

Among the many other applications of electric driving in the factory may be mentioned a couple of sugar granulators which are driven by 10- and 20-h.p. motors, respectively. These machines are of the revolving-drum type. Electrically-driven crystallisers are served by 10-h.p. motors. An interesting feature is a machine for sewing up the bags at the bagging station; this employs a 1.5-h.p. motor. Another piece of equipment worthy of note is a motor-driven stacking machine in the store room; this is in effect a portable 45-deg. elevator.

Reference has been made to the production of cattle food and fertilisers, and in this connection the principal operations involved, at any rate as far as the use of electricity is concerned, are pumping the beet residue from the sugar factory proper, and drying and pressing the pulp. Fig. 8 depicts the driving arrangements for one of the two driers installed. The motor is of 4 h.p., and the drier is of the inclined revolving-drum type.

The preparation of the lime-mixture required for the special treatment in the factory involves a considerable electrical load; a 20-h.p. motor is used to drive a conveyor to take the rock to the kiln, and a couple of 15-h.p. motors are employed for pumping the mixture to the factory.

An interesting item is the "bridge" which spans the river adjacent to the factory. This, in connection with an electrically driven Morris telpher, serves for unloading coal and beet from barges and also for loading the vessels with the factory's products. It is equipped with two motors, one of 35 h.p. for lifting and one of 22 h.p. for travelling. Molasses, a crude residue, is pumped into railway tank trucks from a large reservoir outside the factory by means of a gear-type pump driven by a 10-h.p. motor.

The general lighting throughout the factory is done with industrial-type fittings suspended on chains. The switching for the lighting is d.p. at all points, and special ironclad apparatus is employed for this, embodying interior tumbler movement with rotary operation outside. There are also a number of special-purpose lights in various parts of the building, an example of which is shown in fig. 11. The two vertical rows of lamps provide for the inspection of the interior of the large steam pans. It was found that efficient inspection of the process could only be obtained by means of a separate light at each window. The bells shown between the pans provide a signalling station for communication with the boiler house and the centrifugal floor. The bells are operated directly from the lighting mains at 110 V single-phase.

There are some points of interest in connection with the lighting of the exterior of the factory. It should be realised that this is important in view of the continuous night and day operation of the factory. Floodlighting is utilised to a considerable extent, 500-W projectors being installed for lighting the flumes and railway sidings, and also the river bank. For lighting the roadway outside the factory special weather-proof fittings on wood poles are employed, fig. 10. These are equipped with 100-W lamps.

The complete electrical installation was put in by Messrs. W. J. Furse & Co., Ltd., who have carried out eight beet-sugar electrical installations, and for whose assistance in the collection of the above information we are grateful. Mention should be made of the wiring work, in connection with which unusual difficulties peculiar to beet-sugar-factory work had to be overcome. Galvanised screwed tubing is used throughout, except for the mains and certain lead-in and underground positions, where Maconite is employed. An example of the cabling is shown in fig. 6. The dis-boards are specially designed and manufactured by Messrs. Furse & Co. for the heavy duties pertaining to beet-sugar installations. The boxes shown are of the 16-way type, and consist of sheet-metal cases and doors with copper bus-bars and porcelain fuses. The main feed cables enter at the bottom of the boxes. It will be agreed that the workmanship is very neat. The main cables employed are 3-core, v.i.r., with special compounding over the braiding. The cabling throughout the factory, including the overhead line to the pump house, was practically all supplied by Messrs. W. T. Henley's Telegraph Works Co., Ltd. On the ground floor of the factory the tubing is buried in the concrete, while for the upper floors it is run, generally, on the girders below. Practically all the motors were supplied by the British Thomson-Houston Co., Ltd., which also supplied the lighting fittings, interior and exterior.

It may be worth mentioning that there is a well-equipped laboratory in the building containing a fair amount of small electrical apparatus, including such appliances as small electric furnaces, hot plates and ovens, and some very tiny motors for operating special testing equipment.

Extended Lightning Study.

During the next six months some electrical engineers of the Westinghouse Electric & Manufacturing Co., America, armed with every scientific device obtainable will record each bolt and quirk of every thunderstorm that will play around the crest of Chilhowee mountain in Tennessee, where there is an average of 20 thunderstorms each month during the summer. The heavy artillery of the engineers will consist of Norinder oscillographs, osisos, klydonographs, cameras, and other apparatus, not only to record, but also to diagnose the effect of each lightning flash. This apparatus, which is to be installed on the power lines of the Aluminium Co., of America, will cover a five-mile stretch of wild terrain. Of supreme interest will be the installation of Norinder oscillographs. These instruments are claimed to be much superior to existing types of cathode-ray oscillographs. They operate much like the hidden automatic cameras by which wild animals are made to take their own pictures. Any sort of lightning, from the smallest spark to a 100-million-volt flash, a half-mile long, leaves an exact record of its performance with the instrument. The device measures the rate of rise of the voltage surge, the maximum voltage attained, the duration of the charge, and the rate of decrease. Existing data concerning the effect of surges induced in power lines by adjacent lightning strokes and that set up by direct hits are not accurate, and it is hoped that the experiment will do much to clear up the position.

D

Failure by Public Authorities to Supply.

Some Points Arising from a Recent Case.

By W. ERIC JACKSON, LL.B., Barrister-at-Law.

THE case of G. Scammell & Nephew, Ltd., *v.* Hurley and others, reported in the ELECTRICAL REVIEW of June 15th (p. 1042) raises two very interesting points of some concern to electricity suppliers and consumers. The facts of the case were, in brief, that the defendants, who were members of the Stepney Borough Council, had, during the general strike of 1926, omitted to supply electricity to the plaintiff company in accordance with the statutory duty imposed on the Borough Council as electricity suppliers under the Electric Lighting Act, 1882, and other Acts.

The two main points of defence are of interest. First, it was pleaded that the Borough Council was subjected to *force majeure* and was in the circumstances of the general strike powerless to continue a supply of electricity. Secondly, the defendants relied on the Public Authorities Protection Act. Neither of these defences succeeded.

The Public Authorities Protection Act is probably well-known to readers of the ELECTRICAL REVIEW. Every local authority must be sued within six months of the cause of action. In other words every debt or liability of a public authority becomes statute barred after six months. The Act does not affect actions against Government Departments, which are, in law, treated as the Crown, and are exempt from ordinary legal liability unless a petition of right is granted.

The protection of this Act does not apply to all electricity suppliers. Authorisation by Act of Parliament does not make a supplier a public authority. The Public Authorities Protection Act applies only to local bodies, such as borough councils, town councils and city corporations, which supply electricity; and the fact that *their* debts become statute-barred after six months does not mean that debts in their favour become barred.

Thus, if a local authority which is also a supplier, wrongfully takes away a consumer's own fittings, the consumer must sue within six months; but if the consumer does not pay his electricity charges he may be sued by the authority any time up to six years.

Now since the protection of the Act is only given to public bodies, it does not apply to private contractors who act under the orders of a public authority. It has been held that a contractor who, under contract with a county council, lays down tramway lines in the road, is not protected by the Act, although the authority is.

The same would, of course, apply to cases where a local council has obtained statutory powers to supply electricity and then sub-contracted for the supply to a private undertaker. The undertaker could be sued after six months, but the authority could not.

It must be remembered that in the case of Scammell *v.* Hurley and others, the action was not brought against the Stepney Borough Council as such, but against Hurley and his colleagues personally, for acts done while they were members of the Electricity Committee of the Council. Now the Public Authorities Protection Act affords protection to all persons who act "in pursuance or execution or intended execution of any Act of Parliament, or of any public duty or authority." As has been mentioned above, private contractors who carry out the duties of a local authority are not protected: for their acts, although done in consequence of some Statute or public duty, are not done in furtherance of the Statute. A private contractor works for his own profit, and not in "pursuance or execution" of some Act of Parliament.

The public authority, on the other hand, does not work for profit, but works because it is so ordered by Parliament. Thus a fine distinction exists where the personal liability of members of a local authority is involved. Do such members act "in pursuance of a public duty," or for some other reason?

In the case of Scammell *v.* Hurley, although the members of the Stepney Council seemed to have some interest in the general strike, and it was suggested that they acted more in furtherance of the strike than of the statutory duty of suplying electrical power, Mr. Justice Avory said that there was some evidence that the members had acted in pursuance of their public duty, but he left it to the jury to say whether they had acted *bona fide* in the execution of the Electric Lighting Act or in furtherance of the general strike. The jury found that the members acted not in the *bona fide* execution of their statutory duty, but from other motives.

Accordingly the protection of the Public Authorities Protection Act did not cover the actions of the defendants. There was, however, a second defence, namely, that afforded by the Public Health Acts, which absolve individual members of local authorities from liability so long as they act *bona fide*. This defence also failed.

Now the defence of *force majeure* is peculiar to cases in which a statutory duty is imposed. All suppliers of gas, water electricity, and public undertakers of similar character (railways for example) are bound to carry out the duty which their Acts of Parliament lay down. In the case of electricity, it is not a question of arrangement between consumer and supplier. The supplier must supply so long as the consumer demands and can fulfil the necessary requirements as to payment of charges, &c.

The duty to supply being absolute, the supplier has no defence if he neglects to supply. He has also no defence if he refuses to supply to a proper consumer. Nor has he any defence if he merely fails to supply, unless he is genuinely prevented by some greater force. Slight or unimportant failures of such a character as not materially to affect the value of the supply are not taken into account.

As to what is *force majeure* opinions may vary, as do the decided cases. Inevitable accident, such as the development of a latent defect in a cable causing a breakdown, will excuse the supplier.

War or riot which actually interferes with the machinery is *force majeure*. But where the employés of an undertaker threatened to strike and refused to connect up certain premises, on the ground that they had been wired by non-union labour, this was held not to constitute an excuse to the supplier. The Judges held that *force majeure* did not include a mere apprehension of such a physical or material constraint as might itself amount to *force majeure*.

Increased cost of production caused by the rise in prices consequent upon the War has been held not to be an excuse for diminishing or curtailing a supply of electricity.

The defence of *force majeure* will apply both to cases where there is a special contract between supplier and consumer, and where there is no contract. Where there is a special contract the consumer will be able to claim damages to the amount which he has suffered through the failure of supply. But where there is no such special arrangement the consumer's only remedy is to sue for penalties, which may be anything up to £2 per day. But the consumer in that case may recover nothing for himself. The penalties, strictly speaking, are not the property of the successful plaintiff; but the Court may, and generally does, order them to be paid to him.

An Engineer's Reading.

A plea for greater interest in literature on the part of technical men.

By "S"

A COMMON complaint against technically trained men is that they are devoid of interest in the Arts, particularly in connection with literature. That there is some basis for this accusation must reluctantly be admitted by those familiar with the conditions under which a young electrical engineer pursues his scheme of training.

After matriculating, the student enters upon an intensive course which leaves no room for humanistic subjects. Gone are the joys of English literature, history, and kindred studies; the embryo engineer nowadays has perforce to concentrate on severely technical problems. When college days are over, the "works" and his profession loom largely in the engineer's ken, and as a natural result the technical man tends to acquire a singleness of purpose which in many cases justifies the accusations of uncouthness and lack of culture where engineers are concerned.

Can anything be done to foster an interest in literature among technical men? It is admitted that very little can be done in connection with College Courses; the curriculum is already overcrowded, although some authorities have endeavoured to redress the want of balance between art and science by insisting on an English essay in some of their examinations.

In the big engineering works of the country, however, one sees promising signs of great educational value. By means of lectures, debates, and discussions, much interest can be aroused in artistic subjects. There is great scope for such work in fostering a love of literature, and the help of experts can be enlisted in connection with suitable lectures.

For those who do not care for such formal matters, the public library provides a means of approach to good books. The "open access" system enables the reader to roam at will among the bookshelves, selecting a novel, play, or volume of poetry according to taste. Works libraries are also in existence in connection with apprentice activities, while those who prefer to read the "latest" are catered for by the subscription libraries. Thus there are many opportunities for developing a love of books, although it is realised that engineers are bound to devote a considerable portion of their spare time to the study of technical works and journals. There is need, moreover, for some guidance in reading, and to this end the courses of the Home Reading Association and S. P. B. Mais' "An English Course for Everybody" will prove of great interest.

The writer is one of those who have not been able to devote much time to English literature, but nevertheless has for the past few years found in reading a pleasant relaxation from the routine of modern industrial life. It has been interesting, moreover, to keep a record of the works read; the "log book" contains headings under date, author, title, and comments. The last item presents in a succinct manner the impression given by the book, and is of some personal value in affording opportunities of comparison with later mature judgment.

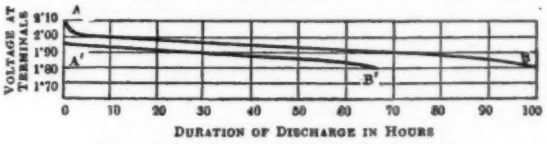
In the space of two years, and without adopting any fixed course of reading, the writer has been able to read most of the novels of Conrad, Hardy, and Galsworthy, and also to indulge in a preference for Shaw among the dramatists. Some catholicity in taste is evident from the inclusion of classical authors, such as Thackeray and Trollope, with the "moderns," Arnold Bennett, Wells, Hugh Walpole, and Feuchtwanger, while there is a sprinkling of American writers, as evident from the names of Sinclair Lewis, Joseph Hergesheimer, and Theodore Dreiser. Poetry is represented by the works of Keats and Swinburne, and also by some anthologies, *e.g.*, "An Eton Poetry Book" and J. C. Squire's "The Comic Muse." Considerable pleasure has been derived —according to the "log book"—from the words of modern essayists, such as E. V. Lucas, on whom appears to have fallen the mantle of the "gentle Elia."

After all, books are our great companions, especially at times of loneliness. Every technical man should therefore endeavour to form a library of his own, for even in these days of diverse and hectic interests, reading can be a source of real pleasure. Books, moreover, make life worth while, for in the sentiments expressed by the great Italian poet Petrarch, they "teach us how to live, and teach us how to die."

The "Accupile" Battery.

Some Particulars of a French Lead Accumulator.

NOTWITHSTANDING the many advantages of secondary over primary batteries, there are still numerous applications in which accumulators cannot usefully be used in place of dry batteries, this being especially the case where facilities are not readily available for the recharging of accumulators. Where only a weak current is required dry batteries can be relied upon to function for several months without any special attention. On the other hand, secondary cells, even when called upon for small discharges, cannot be left long without attention, owing to the internal action that takes place. The problem, therefore, of using secondary instead of primary batteries is, stated M. L. Jumau in a recent issue of the *Revue Générale d'Electricité*, that of reducing the degree of chemical reaction which takes place within accumulators without providing any energy utilisable in an external circuit. This has, he states, lately been achieved in a new French secondary cell known as the "Accupile," the producers of which have devoted special attention to the negative plates—the purity of the raw materials used, the form of building-up the grids, the preparation and formation of the active material, and, finally, a special mounting of the electrodes in the cell itself. The latter is of glass of sufficient thickness to obviate any risk of fracture. Internally the glass receptacle is provided with grooves in which the pairs of electrodes slide. The electrodes are of considerable thickness, while they are spaced at a greater distance apart than usual in order to prevent short-circuiting owing to any breaking-away of the active material. The bases of the electrodes rest on glass blocks, which also serve to prevent short-circuiting by any deposits of active material. The cells are hermetically



Discharge Curves of "Accupile" Cell.

sealed by a cover on which a special composition is run, which is only broken by the terminals and by a plug for the admission of acid and the escape of gases. The dimensions of the cell are such that there is a large reserve of electrolyte above the plates, while as the terminals are non-corrodable the cells can be relied upon to function for long periods without attention. The dimensions and capacities of three sizes of the accumulator are summarised below:—

Amp.-hour capacity	20	40	80
Charging current in amperes ...	0.5	1.0	2.0
Height overall ... ... mm.	170	205	230
Width ... ... mm.	70	80	142
Length ... ... mm.	70	80	80
Weight, with electrolyte ... lb.	4¼	6¼	12

The capacity shown in the table corresponds to a discharge rate varying from 1,000 to 2,000 hours. It is claimed that the electrodes normally lose less than 15 per cent. of their capacity during three months, and only about 30 per cent. in six months. The cells can therefore be used in cases where they can be recharged at most twice a year.

For special applications the makers of the "Accupile" cells have been able to produce one in which the internal losses are even further reduced, giving the results shown in the accompanying diagram. The curve AB shows the discharge of such a cell immediately after being charged, while the curve A^1 B^1 shows the discharge of the same cell at the same rate twelve months after being charged. The loss, as will be seen, is then only 33 or 34 per cent.

Practical tests with the new cells show that after being completely discharged they require recharging for 50 hours. In view, however, of the long time they can be run on a single charge, the need for carrying a large number of reserve cells is greatly reduced. M. Jumau considers that there is a wide field of application for the new accumulators in all cases where the cells can only occasionally be recharged.

The Overhead Lines Association.

A Visit to Greater Felcourt All-Electric Farm.

ON Wednesday last week, at the invitation of Mr. R. Borlase Matthews, a large party of members of the Overhead Lines Association and other guests visited his 600-acre farm at Greater Felcourt, near East Grinstead, and studied the methods that he has adopted in two main branches, namely (*a*) commercial farming, and (*b*) experimental work in the applications of electricity to agriculture.

There are some 67 different uses of electricity on this farm, among which are included those in the cowhouse, in the food preparation department, in the milk-bottle cleaning and sterilising room, and in the dairy. Another example is the making of hay without sunshine. An electric plough (said to be the only one in England) was on view; also an electrically-operated harvester and binder, the output of which has thereby been increased by 30 per cent.

A comparatively new feature was the application of ultra-violet lamps to the treatment of cows, pigs, and poultry; and close to the power house was an 80,000-volt electro-culture plant for crop treatment.

Electricity is used on the poultry farm for the operation of the electric fan-driven incubator (2,400 eggs) and for lighting the laying houses for the purpose of producing more winter eggs. Each laying house provides accommodation for 550 chicks. The laying-house lights are controlled by an automatic time switch which winds itself, follows the rising and setting of the sun, dims the light at bedtime, and imitates sunrise long before dawn. There is a brooder house accommodating 3,400 chicks.

The farm arrangements are at present in process of drastic reorganisation with a view to further demonstrating the value of electricity to the average farmer. As another interesting experiment, since the data for the operation of a large farm have been obtained, the farm is now being sectionalised, and each part put into the hands of a practical working farmer.

The engineering workshop (which is electrically operated) is used for electro-farming experimental work and farm repairs. In this workshop also is manufactured the Felcourt press-button dual-programme wireless receiving set.

Power is provided by hydro-electric plant about a mile away, controlled from a point near the workshop; oil engines are provided as a standby for periods of drought. Excess current is used for water heating. An example of the very cheap support for transmission-line construction, which only costs about £70 per mile, was on view (fig. 2 above; this was described in the ELECTRICAL REVIEW of July 13th).

The farmers' cottages are equipped with electric light, town water and wireless.

In the office are installed modern illumination and electric pipe heating around the skirting. The office equipment includes steel furniture, vertical ball-bearing filing cabinets, correspondence files on the alphabetical-decimal system, and accounts are carried out on the "Auto-Countancy" semi-automatic system (both of which were developed there), also electrically-operated dictaphone and Mercedes typewriting machines. Data and subject matter are filed on the decimal classification system.

The residence (which is about four hundred years old) is in process of being converted into an economic all-electric country house on modern scientific lines. The majority of the rooms, including the kitchen, are wired for radio reception, the simple receiving set for which (made on the farm) is placed in a recess in the wall of the drawing room. In the greenhouse plant life is forced successfully, by the aid of a 2,000 c.p. "Mazda" lamp, equipped with a giant parabolic reflector, which is placed only a few feet above the plants under treatment. In the kitchen garden are to be seen earth-current treatment apparatus and an electric moth trap. The glass frame is electrically heated by resistance wire buried in

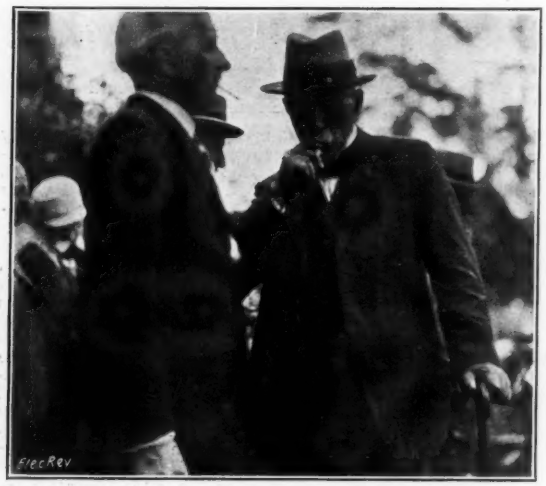


Fig. 1.—Mr. Emile Garcke at Greater Felcourt.

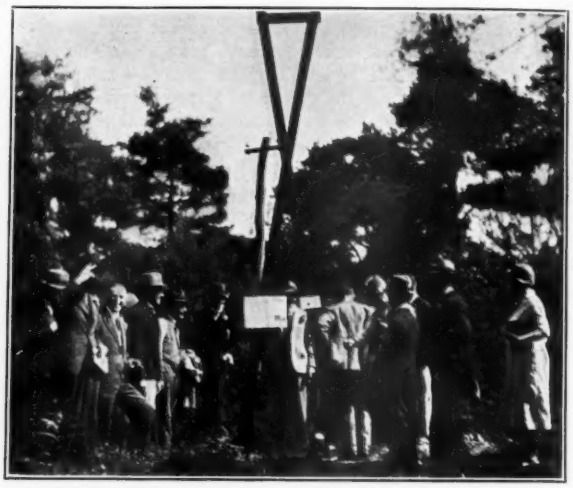


Fig. 2.—Visitors Inspecting the X-frame Pole.

Fig. 3.—Waiting for Charabancs at Dorman's Park Hotel.

Fig. 4.—In the Shade before Tea.

the soil. There is also a small house with beehives within (instead of being in the open air, as is usual), and this is both electrically lighted and heated, so as to avoid disease in winter and obtain an ample supply of apple blossom honey in the late spring.

A school on the Montessori system is provided for children between the ages of three and a half and eleven years, and a new co-educational school for older children is in course of formation.

Great interest was taken by the visitors in all these items, and after they had been entertained at tea, a hearty vote of thanks to Mr. and Mrs. Matthews, moved by Mr. Emile Garcke, and seconded by Mr. W. A. Turnbull, was passed by acclamation.

Legal.

Extensions of Patents.

IN the Chancery Division, on July 18th, Mr. Justice Tomlin granted an extension of four years of the life of a patent, the assignees of which were Messrs. W. T. Glover & Co., Ltd., Trafford Park, Manchester. The patent was for improvements relating to waterproof coverings for electric cables, and the ground of the application was that the company had suffered loss or damage in the exploitation of it owing to the war.

Mr. CORSELLIS, for the company, said the patent was of a remarkable character in that it enabled one to tell 10 or 20 years ahead of the time when the breakdown of a cable was likely to begin, by means of what was called a test sheath.

On the same day Mr. Justice Tomlin also granted an extension of four years of the period of a patent owned by the General Electric Co., Ltd., relating to improvements in electric lampholders, the application being based on loss of opportunity to exploit the patent during the years of the war.

The patent was granted to Mr. M. J. Railing, general manager and a director of the General Electric Co., and Mr. J. H. Collings, the company being the assignees. The date of the patent was November 29th, 1912.

Mr. Frederick C. Curtis, Dorset Square, London, petitioned for the extension of the period of his patent for an electrical regulating switch, on the ground that the war deprived him of the benefit of working it during that period. For the petitioner, Mr. SHELLEY said the invention provided a means for getting better contact by the use of a cross-bar with springs to take up irregularities. The petitioner began manufacture in 1912, but he was on active service from 1914 to 1918, during which time only a few articles were made, and those at an uneconomical price. His Lordship granted a two-years' extension.

Mr. Justice Tomlin granted the petition of the Western Electric Co. for a five-years' extension from July 4th last of four patents for improvements relating to automatic telephone systems on the ground that the company had suffered loss or damage owing to the war.

Mr. TREVOR WATSON explained that the patents related to one of the systems with regard to all of which the G.P.O. had made arrangements with the different companies concerned. But from just before the war until the end of it the G.P.O. was unable to install automatic telephone exchanges. The petitioners were thus unable to derive any benefit from the patents during the period of the war.

His Lordship also granted a four-years' extension of a patent belonging to Alfred T. Blackall, Reading, and Charles M. Jacob, Maidenhead, for improvements in electrical token apparatus for railways, on the ground of loss or damage occasioned by the war.

For the petitioners, Mr. CORSELLIS said the invention was for use on single-line railways, where an engine driver carried a token. According to the invention there was a machine which allowed only one token to be out at a time. At the time the patent was granted the petitioners were in the service of the G.W.R., to whom they granted a full licence to work the patent. They also granted a licence to Tyer & Co., Ltd., Dalston.

Fumes from Barton Power Station.

AT the Manchester Assizes last week, Mr. Arthur Farnworth, a farmer, brought an action to recover damages from the Manchester Corporation for injury to crops and fruit trees, alleged to have been caused by sulphur fumes emitted from the Barton power station.

Counsel for the plaintiff asked for an injunction against the Corporation and an inquiry as to the amount of damages. He said that the nuisance had been evident from the time the station was opened in 1924, when the wind was in a certain direction. The plaintiff was not the only one affected; the Farmers' Union had made representations to the defendants, who had raised the height of the chimneys, but without eliminating the nuisance. After evidence had been given for the plaintiff, Mr. C. Atkinson, K.C., for the Corporation, said that his clients admitted that the station had added to the discomforts of that industrial area. It was run in the most efficient manner, but no generating station could be anything else but a nuisance. However, the defendants were entitled by statute to be a nuisance in this matter.

Mr. H. C. LAMB, the Manchester electrical engineer, said that it was impossible to avoid discharging sulphur dioxide into the air. The trouble had been mitigated by making the chimneys higher, and the number of complaints had been reduced.

Mr. C. D. TAITE, chief engineer of the Lancashire Power Co., testified to the efficiency of the station, and said that he did not think that the discharging of gases at a greater height would make much difference.

Mr. W. M. SELVEY also gave evidence, and said that in his opinion increasing the velocity of the discharge from the chimney, as had been suggested by plaintiff's witnesses, would not improve the conditions.

Mr. ATKINSON contended that the only obligation upon the defendants was to see that the nuisance was reduced to a minimum. Counsel for the plaintiff said that there was no reason why the Corporation could not conduct its station as other authorities did without creating a nuisance.

Mr. Justice TALBOT said that it was clear that what would otherwise have been an actionable nuisance had been authorised by Parliament, and the defendants, therefore, succeeded. He thought, however, that it would be unjust to make the plaintiff pay the costs, and he would, therefore, make no order as to costs.

A Rented Installation at West Ham.

AT the Bow County Court, on July 20th, the West Ham Corporation sued Timothy Donoghue, Plaistow, E., to recover £1 13s. 2d., rental due on an electrical installation, and electricity supplied, and also for a declaration that his contract with the Corporation should continue. Defendant paid 10s. 6d. into Court in full settlement. Mr. HELME, for the plaintiffs, said that the question concerned in this case had arisen several times, and would continue to arise until the point was definitely settled in Court. The Corporation installed electricity in the houses under contracts, and in December, 1926, a representative saw the defendant, who decided to have an installation, and signed the agreement, which provided for twelve monthly payments of 3s. 6d. as rent, and 2s. 4d. a month thereafter. The only way to discontinue the contract was to give 14 days' notice when the tenant was leaving the premises. In reply to Judge Snagge, counsel said that he believed that there was something in the contract that at the end of 15 years the installation was paid for. The Corporation had to protect itself in the matter; it cost £10 10s. to put in the installation, and it could not be at the caprice of anybody who might have an installation and then, after two months, say "Discontinue it," which would mean a loss to the ratepayers of £10 at least. The defendant had only had his installation for 17 months, and if he were allowed to cancel the agreement it would mean a heavy loss. In view of the increasing number of installations, it was absolutely necessary to have the point settled as to whether or no the consumers could terminate their contracts. The Corporation had offered to let defendant buy the installation for 9s. 6d. down, and 9s. 6d. a month for 23 months, plus maintenance, or, if he cared to pay cash, for £10 0s. 6d., but the defendant declined.

The defendant said that he was in a good position when he entered into the contract, but decided to economise when pensioned off. He had paid 10s. 6d. into Court in full settlement, and as he had had to pay the monthly rental in advance, he considered the balance wiped out by that.

Judge SNAGGE said that he was very sorry for the defendant, but there were no terms in the contract for termination, except by removal. The only thing that defendant could do would be to see if he could come to some private arrangement with the Corporation. The point was a very simple one in law, and he was not concerned with any hardship that might arise out of the contract; that solely concerned the defendant who signed it. There would have to be judgment for the plaintiffs for the amount claimed, and costs.

Tilling-Stevens Motors, Ltd., v. Ministry of Transport and Kent County Council.

THE Court of Appeal, consisting of the Master of the Rolls and Lords Justices Sankey and Russell, on July 19th delivered judgment allowing an appeal by the Minister of Transport and the Kent County Council from a judgment of Mr. Justice Clauson in the Chancery Division in favour of Tilling-Stevens Motors, Ltd., in an action brought by the company which raised the question whether its petrol-electric vehicles were electrically propelled. The company brought the action against the Minister of Transport and the Kent County Council for the return of duties which they said they had paid in excess of what was lawfully due upon mechanical vehicles. Electrically-propelled vehicles in general paid only half the duty paid by other vehicles.

Mr. Justice CLAUSON decided that the plaintiffs' petrol-electric vehicle was electrically propelled, but the Attorney-General, on behalf of the Crown and Kent County Council, contended that the vehicle was not electrically propelled because the source of propulsion was not electricity, but another motive power.

In giving judgment, the MASTER OF THE ROLLS said he thought Mr. Justice Clauson had put too narrow a construction on the statute. The vehicles did not come within the category of electrically-propelled vehicles. He thought the tax imposed on the respondents was the correct tax. The appeal would be allowed and judgment entered for the defendants with costs.

Lord Justice SANKEY concurred, but Lord Justice RUSSELL dissented, being of the opinion that Mr. Justice Clauson was right in holding that the vehicle in question came within the designation "electrically propelled." He thought the question was one which must be decided on popular language, and in his opinion the Court, in allowing the appeal, was looking at the substance and usurping the functions of the Legislature. In his opinion the appeal failed, and should be dismissed.

By a majority of the Court, therefore, the appeal was allowed.

Evans v. Farnham Gas and Electricity Co., Ltd.

MR. JUSTICE ROMER, in the Chancery Division on July 20th, on the motion of Miss Jessie Evans, of Conehurst, Frensham, Surrey, granted an injunction restraining the Farnham Gas and Electricity Co., Ltd., from digging a trench in Grange Road, Frensham, for the laying of electric cables, so as to cut through the anchor roots of her Scotch fir trees within a distance of 10 feet of the trees.

Mr. SWORDS, for the company, said they had a statutory right to dig trenches in the roads and all they had to do was to see that no more damage was done than was necessary for the purpose. They had done this, and, moreover, they contended that the cutting through of the roots would not result in any damage to the trees, as was alleged.

His LORDSHIP gave facilities for a speedy trial of the action, and the plaintiff gave a cross-undertaking in damages.

Alleged Fraudulent Consumption of Electricity.

ON July 19th, at the Marlborough Street Police Court, Harry Posolsky, Wardour Street, W., was charged at the instance of the Charing Cross Electricity Supply Co., Ltd., with the fraudulent consumption of electricity from the company's supply. It was stated for the prosecution that the defendant's supply had been cut off, but he had obtained electricity by running wires to another consumer's apparatus in the same premises. Defendant pleaded "Not guilty." Mr. Mead imposed a sentence of six months' imprisonment in the second division. Recognisances were fixed with a view to an appeal by the defendant.

Reviews.

Distribution of Electricity by Overhead Lines. By WILLIAM T. TAYLOR. Pp. vii+265; figs. 44. London: C. Griffin and Co. Price 25s. net.

The appearance at the present moment of a book on this subject by an author of experience is most opportune. It is highly desirable that the best possible practice in overhead distribution should become general before too much of our rural work is completed, and the clear exposition, not only of what the author has found to be best, but of the reasons why it is so, should do much to set our engineers, to many of whom overhead work is new, on the right track.

The author commences Chapter 1 with a very interesting outline of the history of the development of the distribution of electricity. Much of the information is not generally known, and, apart from its inherent interest, gives the reader a better understanding of the why and wherefore of our present practice. The chapter continues with a general consideration of the numerous factors of an overhead distribution system. The author severely criticises present methods, but, unlike most critics, offers improved ones to take their place.

On page 9 he enumerates the problems which must be faced and dealt with before we can hope for an economical and efficient system for the distribution of electricity for light, heat, and power. The present requirements of the P.M.G. are unthinkable to the author, who, very rightly, considers that the Post Office must take its proper place in the activities of the nation, and not be allowed to stifle other, and equally necessary, ones.

Chapter 2 deals with the location and design of distribution lines. It is pointed out, and very necessarily in view of the haphazard methods adopted by some engineers in this country, that at least as much care and technical knowledge are needed in the location, design and construction of an overhead distribution line as for an equivalent underground cable installation. The principal factors are enumerated and dealt with at length.

The difficult problem of wayleaves is discussed, and some useful suggestions are put forward.

Mr. Taylor is no believer in *laissez faire*, and makes a good case for the alteration and improvement of existing regulations and practices. He gradually unfolds a new system of overhead distribution, construction, and practice which possesses many advantages over existing methods, and for this reason alone the book is of more than normal interest.

In Chapter 3 the author treats of the various problems of design, mechanical, structural and electrical, with as little mathematics as the subject permits. He gives a useful chart (fig. 15) connecting the several electrical quantities together, and tables dealing with the inter-relation of sag, tension, and span for all conductor metals.

Copper and copper alloy are in the author's opinion by far the most useful and economical metals for this class of work, but aluminium also has certain uses.

It is pointed out that overhead construction is an economic necessity and that wood poles give the best general results. Much is said about minimising the usual popular objections to overhead lines by placing them in alley-ways and other unobtrusive positions, and joint occupancy is advocated.

Chapter 4 is devoted to aspects of construction: here, as in the rest of the book, the author brushes aside our insular ideas and boldly advocates that which, in a wide and extended experience in various countries, he has found to be best.

Wood poles and wooden cross-arms are given preference because they are universally used. New methods of construction in details are put forward, and some of our existing methods are shown to be faulty or undesirable.

For secondary distribution, the use of impregnated-cotton braided wires is advised, so as to give partial protection against interruption of service due to contacts with trees, &c.

In Chapter 5 are discussed the merits of the various possible systems of distribution from all points of view.

The three-phase 4-wire system is shown to possess many advantages not only in economy of copper, but in being more flexible and adaptable. A 3-phase 4-wire distributor can, for instance, be gradually built by first running a single-phase line, and, as the load grows, adding a second and finally a third phase. The star-star connection is pointed out as the cheapest, though not always the best, for the transformers, on both primary and secondary distribution circuits. An allusion is made to the two-phase system which the author predicts is likely to be more generally used in the United States, but although he states that it has outstanding merits, he prefers the 3-phase 4-wire system. The chapter concludes with some remarks on protection.

Chapter 6 on "Distribution Maintenance" is of interest to all engineers, and more particularly to those who are just embarking on overhead distribution. Mr. Taylor in this chapter enters very fully into the causes of troubles, and is a constant advocate of prevention rather than cure. He again urges (this time from the maintenance point of view) the placing of poles in situations where they will receive a minimum of interference, and he prefers sound construction, carefully designed, to a multiplicity of safety devices which, in themselves, frequently constitute a danger.

A method of detecting faulty insulators is described, and an outline is given of a proper system of operation maintenance embodying the use of relays, &c., which will indicate conditions likely to cause or develop into faults.

In an Appendix are given the Overhead Line Regulations for this country, together with the interesting changes made in April, 1928.

The text is illustrated by 57 photographic illustrations and diagrams and 42 tables. An excellent index has been compiled, and at the head of each chapter is a useful synopsis of its contents. A photograph of the author constitutes the frontispiece.

The book is full of detail, and contains many new ideas and suggestions: it is well written in a convincing style, and clearly printed in good type. It is a most useful work at the present time and should be widely read.—W.E.P.

Transmission Line Engineering. By W. W. LEWIS. Pp. vii+361; 200 figs. and 79 tables. London: McGraw-Hill Publishing Co., Ltd. Price 20s.

There are too many books on overhead power transmission lines which treat of such matters as the electric circuit under normal (smooth line) operating conditions, efficiency, regulation, power factor, and such matters. All such works are more or less repetitions of old knowledge. This book takes a step away beyond these common every-day facts.

Although the title of the book stretches a point, because of its exclusive treatment of the electrical side of transmission-line engineering, it is a useful book to those engaged in transmission-line work of the bigger order. It provides good material apart from the usual methods of calculating the necessary electrical constants. One chapter is devoted to the calculation of short-circuits, and gives much useful and practical information on single-phase and three-phase short-circuits.

Chapter V deals in a practical way with triple harmonics and their multiples. Then follows a short discussion on auto-transformers, their connections and rating, &c. Chapter VII treats of line disturbances, such as switching, arcing earths, &c. After this come an important chapter on telephone interferences, another chapter on the power limit of transmission systems, and a final chapter on earthing systems at the terminal stations.

This is a book that deals with the theoretical problems in a practical way; by means of worked examples various problems are solved for networks and individual lines. The section on steady-state stability is timely.

The book is based entirely on American practice, and the tabulated line constants and much other matter are all in conformity with American standards. Nevertheless, the fundamental principles and practical data presented should be useful to the transmission engineer in this country.

High-Tension Line Practice. By ERNEST V. PANNELL. Pp. xi+277; figs. 124. London: Constable & Co., Ltd. Price 22s. 6d. net.

In this work the author has attempted to set out the best practice in overhead-line construction and design rather than the practice in this or any particular country. He has confined himself to the mechanical and structural sides of the subject (except where the electrical side is so intimately connected with it as to be inseparable) and has intentionally omitted any consideration of the electrical problems.

In his introductory remarks he points out that overhead line engineering requires a combination of the electrical and the structural engineer's knowledge, and consequently there is developing a "transmission line engineer."

The book is divided into six chapters; in the first three the various materials and types of structure are very fully dealt with, and in the others design, construction and economics are treated.

In addition to a comparison (in Chapter 1) of the various metals in general use for conductors, Mr. Pannell devotes several pages to the processes of wire manufacture and stranding—a branch of the subject which will be greatly appreciated by many readers. Characteristics of steel-cored aluminium and copper are given, and a detailed comparison of their respective merits and demerits, together with much useful information on copper-clad steel, bronze and other types of conductor. The composite cable is very fully dealt with, both in theory and practice, and the reader seeking information on these matters will find Mr. Pannell's remarks of value. Attention is directed to the time element in the stretching of wires—a point only too little appreciated by many engineers—and some of the effects of its neglect are enumerated.

Chapter 2 is devoted to insulators. The author has here adopted the same procedure as in the foregoing chapter, of describing the manufacture of the material and the article itself *ab initio*, and points out the stages at which faults are likely to occur. He considers porcelain to be the only material requiring consideration in the present state of the art, and skilfully leads his reader through the stages of development of the high-pressure insulator to the most recent designs and patterns. Only where necessary is the electrical side of the question touched upon, but the mechanical problems involved are dealt with from every point of view, and numerous examples of actual practice quoted.

Conductor clamps and other "hardware" usually associated with the insulator are fully described, and many illustrations included. The author has devoted special attention in this chapter, as in that on conductors, to the use of steel-cored aluminium, which, in view of the decision to use it on some of the "grid" lines, is at the moment of special interest.

"Supports" forms the subject of Chapter 3. The author considers wood and steel the principal materials for line supports, and, though he also mentions reinforced concrete, he dismisses it with rather less consideration than such a useful material appears to warrant.

The methods of preserving wood poles in America are compared with the European methods, and it is interesting to find British wood pole practice is far ahead of American practice. The various types of wood pole are discussed, and comparisons of their strength and life made. Examples of American lines are given, but some British ones would have been interesting. As the author's intention is to deal with the higher voltage lines, the greater portion of the chapter is naturally devoted to steel structures. The various uses of rigid (wide and narrow base) towers are fully dilated on, and a good argument is put forward for the use of the flexible frame—an element entirely absent from the British practice. The Malone tower footing and guy anchor is shown to be a great saving on the older methods, and Mr. Pannell's remarks may help to break down some of our expensive British exactness. The principles of the design of steel structures are treated fully, and a large number of designs given.

Having discussed the various problems relating to the three material portions of the line, the author now proceeds, in Chapter 4, to deal with the design of the line in general—that is, the inter-relation of sag, tension and loading of conductors, span length, spacing and clearance, and the location of the supports. He expresses the opinion that the more usual parabolic method of calculating sags is not sufficiently accurate for spans of 800 ft. or more, and gives in detail a simple and useful method for calculating sags by a universal Catenary Chart. He advocates the use of long spans, not only on the ground of economy, but also for greater reliability and as a means of avoiding possible uplift at towers. A number of examples of specially long crossing spans is given, and many interesting details are shown.

On page 176 a table of ground clearances required by the U.S. Safety Code is given, and it is interesting to note that a difference is made between footpaths and highways—a point of which our Overhead Lines Association might make use.

In the chapter on Construction (Chapter 5) the author deals with the work of erection in the field from the preliminary survey to the final stringing of conductors. He goes into detail, both of method and of gear, and gives a useful and interesting account of what are no doubt the best methods of doing the work. Unfortunately, however, some of the methods are impracticable in most parts of this country on account of our land being cut up into small cultivated fields by hedges or walls, and we are compelled to use less efficient means.

In the last chapter (6) the author considers the overhead line from the economic point of view. He separates and treats individually the various items which make up the cost of a line, and quotes many very useful figures relating to undertakings in various parts of the world. As transmission lines are frequently essential parts of hydro-electric power plants, Mr. Pannell has very wisely included some remarks on water power development from the cost point of view.

The difficulty of obtaining wayleaves, particularly in this country, has not been overlooked.

It is pointed out that in most countries a public utility body has a legal right to "eminent domain" and that where such legislation exists it is seldom necessary to use it as its mere existence is a healthy corrective to that type of property owner who considers himself of more importance than the Commonwealth.

Many instances of actual costs are included in this chapter, and they are rendered more useful than is often the case by the inclusion of basic rates or percentage values.

Mr. Pannell shows that although the cost of overhead lines is steadily rising on account of their increasing perfection, the cost per kilowatt mile is decreasing.

The text is interspersed throughout with 60 tables and 124 excellent charts and photographic illustrations, and there is a useful alphabetical index and a list of illustrations.

The book is written in a clear, concise and convincing style, and contains much useful information for the transmission line engineer, both in the office and in the field.

Telephone and Power Transmission. By R. BRADFIELD, B.A., and W. J. JOHN, A.M.I.E.E. Pp. xi+238; figs. 113. London: Chapman & Hall, Ltd. Price 21s. net.

One is led to wonder why a book treating entirely of general theory, and made up of two parts, should combine telephone transmission with power transmission; however, where the subjects are sufficiently involved, there is good reason for combining these two distinct branches of transmission in one volume.

In Part I the endeavour has been to simplify the general theory of telephone transmission, and in Part II general theory pertaining to power transmission is dealt with. The mathematical introduction of Chapter I has been well prepared, and requires a minimum of mathematical knowledge. Unfortunately, the treatment of telephone transmission is both weak and incomplete, so much so that only a limited use can be made of what is given. Some of the most important omissions are the entire absence of a discussion of the various forms of telephone interference, of the effects of balanced and residual voltages and currents, of telephone and power circuit transposition schemes, of the value of co-ordinated transpositions, of unbalanced relations of telephone and power circuits, giving their causes and remedies, of the effects of earth on power and/or telephone circuit conductors, of the long and close parallel operation of power and telephone circuits for normal and abnormal conditions, of the inductance between telephone and power circuits, giving its cause and remedies, of the transverse and longitudinal induced voltages, of troubles from harmonics, of co-ordination of power and telephone lines, of the theory and use of wave traps, &c. All these omissions are so important that a reader interested in power transmission is likely to be misled by the title of the book. The activities of telephone and power-transmission engineers are widely separated, but a discussion of the subjects mentioned here, which are omitted from the text, would serve to draw their interests closer together in questions of co-ordination of their respective lines to bring about a minimum of interference, and greatly facilitate better understanding and unified working, and possibly the looked-for relaxation of the P.M.G.'s requirements, &c. Along these lines of thought such a book dealing with both classes of transmission (according to the ambitious title given) would tend to fill the wide gulf and ultimately serve a national purpose. Unfortunately, the authors have failed to grasp this rare opportunity.

Part II deals with the general theory of power transmission and the phenomena of travelling waves, questions which are timely for this country, and represent a subject of great importance. However, the discussion on travelling waves, although very commendable as far as it goes, lacks essential matter to make the subject sufficiently interesting to transmission and operating engineers. The subject could have been extended better and to more practical purpose by giving information on such matters as the advantages of the different conductor dispositions, number of overhead ground wires required, lightning flashover values of insulators necessary for different working voltages (showing how they are obtained), safe height of line conductors, induced-potential gradients of values reasonably close for framing calculations, percentage increase in flashover by using arcing rings, &c. All these and other problems belong to the subject of travelling waves, yet none of them are referred to in the text. There is no mistaking the fact that flashovers may not occur when the voltage rise induced by a thundercloud *equals* the flashover voltage of the insulator: however, the reader chiefly desires to know of the best means for reducing the former, and the best means for increasing the latter, such that the insulation is not too great in value as compared with that of the terminal apparatus.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Yorkshire Agricultural Show.

The Halifax Corporation Electricity Department had a large and attractive stand at the Yorkshire Agricultural Show, at Halifax, from July 18th to 20th, showing all types of lighting, cooking, heating, and other domestic electrical appliances, a selection of power plant, radio equipment, and sun-ray apparatus. During the three days there were frequent demonstrations. Messrs. Taylor & Parsons, Ltd., of Bradford, exhibited vacuum cleaners, sun lamps, hair driers, kettles, fires, &c. The Hurley Machine Co., of Oxford Place, Leeds, displayed and demonstrated "Thor" electric washers and vacuum cleaners; Messrs. R. A. Lister & Co., Ltd., Dursley, and Messrs. H. Bushell & Sons, York, refrigerators; and Electrolux, Ltd., refrigerators and cleaners. At a meeting of members of the Yorkshire Agricultural Society during the show, a vote of thanks was accorded the Halifax Corporation for providing electricity gratis for the purposes of the show.

Australian Radio Patents.

The Melbourne *Argus* reports that reserved judgment has been delivered in the action brought by Marconi's Wireless Telegraph Co., Ltd., and Amalgamated Wireless (Australasia), Ltd., against David Jones, Ltd., alleging infringement of a Commonwealth patent covering grid leak rectification. The defendants attacked the validity of the patent. The invention was patented by Dr. Irving Langmuir in the United States on October 29th, 1913. The Marconi Co. became assignees of Langmuir on November 21st, 1919, and in the following year they applied for the grant of Commonwealth letters patent; the patent was granted and dated as of October 29th, 1913. The matter was one of the test cases which, under the terms of the recent statutory agreement between the Commonwealth Government and Amalgamated Wireless, Ltd. that company is required to prosecute to determine the validity of a patent. The judge held that the granting of the patent by the Commonwealth to the Marconi Co., as assignees of Langmuir in November, 1923, was invalid, and that the plaintiffs had no right over the invention in the Commonwealth. He ordered the plaintiffs to pay the costs occasioned by the reference to the Court.

The Telephone Cable Industry.

Mr. Kelly, on July 24th, asked the Postmaster-General if he would state why the Engineering Department of the Post Office had suggested to manufacturers of telephone cable in Liverpool and elsewhere that they should temporarily close down this section of their factories and disband their staffs. Sir W. Mitchell-Thomson said that no such suggestion had been made by the Post Office. It was, however, true that development would be, for the present, more in the direction of local lines than of main cables, and consequently the demand for those cables would be smaller.

The *Liverpool Post* reports that an official of the British Insulated Cables, Ltd., Prescot, stated recently that unless that company could obtain a big increase of foreign orders the drastic cuts in the P.O. programme would mean that 2,000 workers would be out of employment in Prescot alone. "The telephone cable-making industry throughout the country will be seriously affected," he said, "and will result in about 20,000 being thrown out."

Argentine Telephone Rates.

The Argentine Government recently issued a decree cancelling the increase in the tariffs of the United River Plate Telephone Co., Ltd., which was granted in October, 1922, to meet the higher expenses engendered by the war. The board of the company has entered a protest against the Government's action, contending that it is acting illegally. The correct procedure was for the Government to consult the company and, failing agreement, to resort to arbitration.

Employment During June.

The July *Ministry of Labour Gazette* says that employment in June remained quiet on the whole in the engineering industry. There was a decline in the motor-vehicle section, but in the electrical section employment remained fairly good. There was a rise in the proportion of unemployed in the engineering industry, as a whole, from 8.6 to 9.0 per cent. In the electrical engineering industry the proportion remained steady at 4.9 per cent. There was a rise in unemployment in the electrical wiring and contracting industry—from 8.1 to 8.4 per cent., but in the electric cable, wire and lamp manufacturing group there was a small decline, from 5.7 to 5.6 per cent. The actual numbers of unemployed in the sections referred to were as follows:—Engineering, 87,339 (including electrical engineering, 3,848); electrical wiring and contracting, 1,196; electric cable, wire and lamp manufacturing, 4,707.

The German Cable Industry.

The exports of cables from Germany are stated to be on about the pre-war level, *i.e.*, between 40,000 and 50,000 tons per annum. But the output capacity of the cable works shows a material increase and the home market cannot absorb the whole of the additional production. In 1926 the exports were 47,000 tons, and in 1927 43,000 tons. The best customer last year was Holland, which imported 13,000 tons, of which a large quantity was for the Dutch colonies. Argentina occupied the second position with 6,000 tons, and Sweden the third with 1,900 tons, being followed by between 1,200 and 1,500 tons each in the case of Finland, England, and Poland. The prices in the export markets are stated to be much depressed, and large transactions are sometimes keenly contested.

German Tramway Appliance Exhibition.

In connection with the annual congress of the German Association of Tramways and Light Railways a tramway appliance exhibition is to be held in Essen from September 21st to 30th next.

Electricity and Gas at Rotherham.

A Special Committee of the Corporation Electricity and Gas Committees has considered the question of a working arrangement in connection with the carrying out of the assisted wiring scheme, and has decided that no further canvassing shall be allowed by firms or outside individuals for the wiring of customers' houses, but that if it is found necessary in the future to canvass, the work shall be undertaken by the paid staff of the Corporation. That the number of dwelling houses or other premises in the Rotherham gas area to be wired for electricity under the assisted scheme shall be fixed at a rate of not exceeding 1,000 per annum; that the electrical engineer and gasworks manager shall endeavour to arrive at an agreement in connection with all applications received, and all other matters incidental to the carrying out of the scheme so far as it affects the Gas Department; that, failing a settlement being arrived at, that the matter shall be left for settlement to the chairmen of both departments; and that when any new gas mains or cables are laid in the future the official of each department shall be acquainted so as to avoid the possibility of overlapping.

New International Rumanian Company.

The Brussels correspondent of the *Financial News* reports that the *Compagnie Financière Entreprises Hydroelectriques (Hydrofina)* has been founded, with a capital of 150,000,000 fr. The capital of the concern, whose activity will be centred on Rumania, was subscribed by the Société Générale; Banque Bruxelles; Banque Philippson; Société Electromécanique, Paris; Diskont-Gesellschaft, Vienna; Brown Boveri, Vienna; Electrica Bucharest; and other concerns.

Annual Holidays.

The works and offices of BROOK MOTORS, LTD., Huddersfield, will be closed from August 11th to 19th inclusive for the annual holidays.

Messrs. FREDERICK THOMAS & Co., LTD., Hampstead Road, N.W.1, announce that their works and office will be closed from August 3rd to 13th.

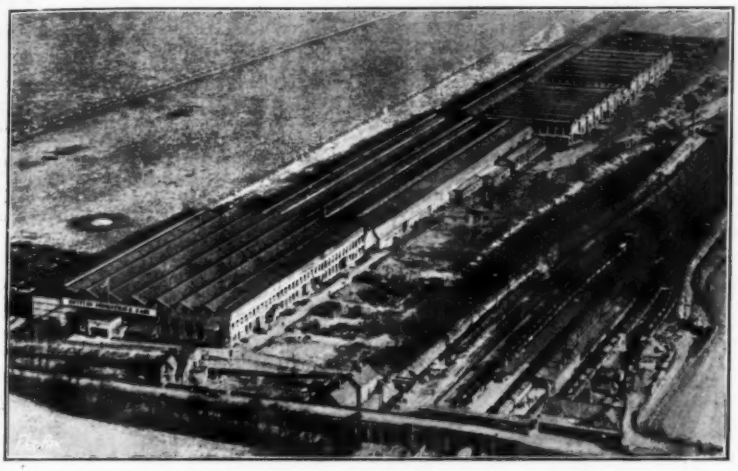
The works of Messrs. E. R. & F. TURNER, LTD., and BULL MOTORS, LTD., Ipswich, will be closed from 12.30 p.m. on August 4th until 9 a.m. on August 13th. The offices will remain open.

New Persian Customs Tariff.

The *Board of Trade Journal*, dated July 19th contained a translation of the new Persian Customs tariff which was approved on May 3rd. This shows the minimum and maximum duties; British goods receive the benefit of the minimum rates. Among the goods affected are machines and apparatus (including generators, &c.), telephone and telegraph apparatus, electric lamps, scientific instruments, &c.

The British Industries Fair.

We reproduce herewith a photograph taken from the air which illustrates very well the immensity of the Castle Bromwich buildings which house the Birmingham Section of the British Industries Fair. The expansion of the Fair has been so rapid in the last two or three years that it has been necessary to double the space for exhibits. For the eighth Fair, that of 1927, 70,000 sq. ft. of space was added, and for the following (this year's) Fair another 130,000 sq. ft. was roofed in. To-day there is 400,000 sq. ft. of floor space all under one roof which makes Castle Bromwich the largest exhibition hall in the country. There is every indication of further expansion; this year the number of trade buyers increased by 50 per cent.



The Castle Bromwich (Birmingham) Fair Buildings.

over the last year's figure, and the number of exhibitors continues to grow.

In this year's Fair there were 84 firms exhibiting in the Electrical Section, occupying 21,000 sq. ft. of space. Up to the present date (with seven months to go), approximately the same area has been let, but there are 63 firms instead of 84. An area of about 30,000 sq. ft. has been allotted to the Electrical Section. Of this, some 4,000 sq. ft. is required for service quarters, &c., so that there is only about 5,000 sq. ft. still available. At a meeting of the Electrical Section Advisory Committee last week it was decided to concentrate efforts for the next two or three months on getting a big increase in the number of manufacturers exhibiting, even if it should be necessary to "ration" those who would like to book a large area.

Book Notices.

"Code for Electricity Meters," third edition, 1928. A.E.S.C. Standard No. C12, 1928. Prepared by a joint committee under the sponsorship of the Association of Edison Illuminating Companies, the National Electric Light Association, and the U.S. Bureau of Standards, with Dr. J. Franklin Meyer, of the U.S. Bureau of Standards, as chairman. Pp. 132. Published by the National Electric Light Association, New York City. Price $2.00.—The "Code for Electricity Meters" was originally formulated in 1908, and in 1912 the second edition, when published, was generally recognised as the governing standard in this field. The second edition, with an added section on demand meters, which was formulated in 1920, was submitted to the American Engineering Standards Committee and approved as an American Standard in July, 1922. About three years ago a general revision was undertaken, and the third edition was approved by the American Engineering Standards Committee as the current American Standard in February, 1928.

Government Department "Electrical Specification No. 13," dealing with Leclanché cells (sack element) was recently issued by H.M. Stationery Office (price 2d. net). It is a detailed specification of dimensions, electrical characteristics, tests, and components.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVI. July, 1928. No. 379. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVII. July, 1928. No. 7. New York: The Institute. Price $1.

Social Events.

On July 14th the head office, fitting shop and warehouse staffs of the Welsbach Light Co., Ltd., held their annual outing, proceeding by char-a-banc to Hindhead, where lunch was served, presided over by the general manager, Mr. H. Talbot. During the afternoon the annual sports were held, and after tea the prizes were presented by Mrs. H. Talbot. The party left Hindhead at 8 p.m., arriving at King's Cross at 10.30.

On July 14th a party of 46 of the engineering sales staff of the Edison Swan Electric Co., Ltd., spent a day at Bedford. At lunch Mr. T. S. Read, engineering sales manager, was the guest of the party, and afterwards there were sports, mainly of a humorous nature. The party was left to its own devices for a few hours, and after tea the prizes were presented by Mrs. Read, and a concert followed. The party reached Ponder's End at 11 p.m.

The annual sports of Messrs. J. G. Statter & Co. were held on July 14th, in the grounds of the residence of Major G. S. Marston. Prizes were presented by Mrs. Marston, after which Mr. Statter proposed a vote of thanks to Mr. and Mrs. Addenbrooke, the donors of a large silver cup, to be held each year by the competitor obtaining the greatest number of points. The holder this year is R. Honour. The visitors included Mr. L. Addenbrooke, Mrs. Addenbrooke, Mr. W. Allbright and Mrs. Allbright.

The employés of Messrs. Macdonald, Syer & Co., Ltd., held their annual outing on July 14th. They journeyed to Margate by char-a-banc, and had luncheon and tea at the West End Restaurant.

On July 14th the employés and staff of the L.P.S. Electrical Co., Ltd., held their annual outing. They proceeded by road to Margate, where an excellent lunch was provided by the company, and an enjoyable drive back in the cool of the evening completed a perfect day.

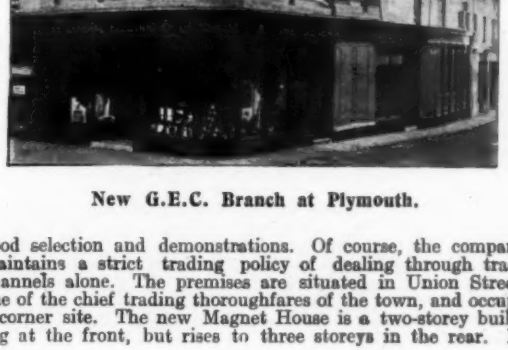
On Monday, July 16th, a fleet of motor coaches conveyed the directors and employés of Venner Time Switches, Ltd., to Henley-on-Thames—a delightful drive in brilliant sunshine. Luncheon was served in the Town Hall to about 350, including the staff of the foundry at South Harrow. There were speeches by Mr. E. E. Sharp and Mr. Graseby. Boating, bathing and games occupied the afternoon, followed by tea and a dance in the Town Hall.

On July 12th the Sheffield Electrical Trades Sports Club entertained the cricket section of the Leeds Electrical Club at Hathersage. A cricket match was played, resulting in a win for Sheffield. Afterwards a party of 90 sat down to dinner at the George Hotel, Hathersage. Later there was a concert, and during the evening Mr. Albrow, the chairman of the Sheffield Club, welcomed the visitors, and Mr. C. Wood, the chairman of the Leeds Club, responded. A silver cigarette case was presented to Mr. Spooner, of Sheffield, and Mr. Reynolds, of Leeds, for the best cricket performances, and Mr. Robert Neill presented to the winning team the cup, which is competed for annually.

Messrs. S. ROGERS & Co., LTD., electrical contractors, Fitzroy Street, W.1, held their summer outing on July 14th, when a party of 26 employés and guests went to Brighton by motor coach. Luncheon and tea were provided at the New Ship Hotel, where surprise gifts, kindly sent by the Union Cable Co., Ltd., were distributed.

New G.E.C. Branch at Plymouth.

The Plymouth branch of the General Electric Co., Ltd., was officially opened on Monday last. Showrooms have been established with the definite view of assisting retailers of electrical goods in the counties of Devon and Cornwall to give the best possible service to their customers by providing them with a good selection and demonstrations. Of course, the company maintains a strict trading policy of dealing through trade channels alone. The premises are situated in Union Street, one of the chief trading thoroughfares of the town, and occupy a corner site. The new Magnet House is a two-storey building at the front, but rises to three storeys in the rear. In



New G.E.C. Branch at Plymouth.

Union Street spacious double-fronted windows provide ample accommodation for displays, and auxiliary displays are made available by additional windows which flank them. There are two showrooms on the ground floor, one devoted chiefly to household electrical appliances and the other to lighting fittings and accessories.

The lighting fittings showroom is at the rear of the outer showroom, and a wide stairway leads thence to a wireless lounge and demonstration room on the first floor. The offices of the manager (Mr. S. Hack), and the departmental managers, and the counting house adjoin the wireless lounge. The offices of the clerical staff and main stockrooms are situated on the same floor, while the lamp stores occupy the whole of the third floor.

Bankruptcy Proceedings.

H. S. STEPHENS and S. WEILL, trading as Stephens & Weill, electrical engineers, 55, Great Eastern Street, E.—A sitting of the London Bankruptcy Court was held last week, before Mr. Registrar Mellor, for the public examination of Simon L. Weill, a partner in this firm, which failed in August, 1927, with joint liabilities of £36,770 and assets valued at £1,487. The debtors attributed their insolvency to losses by bad debts, by sale of goods below cost price, to excessive drawings by the partners, and to loss by having financed certain German manufacturers.

Mr. H. A. Gaine, Assistant Official Receiver, reported that the debtor Stephens had been discharged from the proceedings. He examined Weill regarding the delivery of goods valued at £6,466, and the debtor agreed that those goods had been specifically hypothecated to a bank, and were sold to other persons without the knowledge of the bankers. The only explanation he could offer was that of negligence of his clerk. He admitted that the result was that the money owing to the bank went into the pockets of the firm, but added that his partner had nothing to do with those transactions. Questioned regarding the formation of the company which took over the business, Stephens stated that one of the assets taken over was the name "Seabrook." In 1926 the firm of Seabrook Bros. gave up business, and Stephens and Weill purchased the stock, valued at £1,500, for £1,250, the purchase including the right to call certain articles "Seabrook." He (debtor) was appointed managing director of the company for five years, at a salary of £6 a week, and his son Bernard, who had previously been employed by Stephens and Weill at a weekly salary of £3, was appointed to the post of import manager at a salary of £18 a week, plus 10 per cent. of the profits. The company was formed for the benefit of the creditors. The Official Receiver suggested that the formation of the company was merely a device to provide for his future, and that his son was put forward merely as a nominee. The debtor said that he knew nothing of the bankruptcy at that time. His son's salary was later reduced to £12 a week, and a traveller was engaged at £5 a week and commission. Asked regarding a number of transactions with the Universal Supply Stores, the debtor said that they supplied goods to those customers who gave in exchange bills of acceptance which they discounted, the result being a loss to the firm of about £1,000. The examination was closed.

C. S. HILL, trading as Sanderson Hill & Co., Waltham Street, Hull, electrical factor.—The receiving order herein was made recently on the debtor's own petition, and the first meeting of creditors was held on July 17th, at the Official Receiver's Office, Hull. The debtor returned a statement of affairs showing liabilities of £2,138, against assets of £861. The following are creditors:—

	£		£
Abbey Cables	30	Hill, C. A.	93
Berry's Electric, Ltd. ...	36	Hecht, L., & Co.	26
Calvete, I., Ltd.	23	Martin & Son	30
Cable Accessories Co., Ltd.	29	Magna Wire & Cable Co.	52
Edison Swan Electric Co., Ltd.	166	Parsons, C. H., Ltd. ...	68
Eustace, F.	25	Roneo, Ltd.	28
Falk, Stadelmann & Co., Ltd.	91	Steiner, I. & M., Ltd. ...	46
General Electric Co., Ltd.	29	Wandsworth Elec. Mfg. Co., Ltd.	79
Helliwell & Co.	32	Webber, W.	488
Hales, Hancock & Goodwin, Ltd.	53	Wilson, E. R.	88
		Yorkshire Elec. Co. ...	32

A. L. ASTILL, trading as the Eastern Wireless Supply Co., 362, High Street, Lincoln, wireless engineer.—The public examination of this debtor was held recently at the Sessions House, Lincoln, when liabilities of £1,056 were disclosed, with a deficiency of £924. It appeared that debtor had been in business since 1924, first in partnership, and later on his own account. He had had ill-health, and had been undersold by people who took up wireless as a side-line.

J. D. RIDLEY, trading as The Eastern Counties Electrical Constructional Co., electrical engineer, late 41, Buttermarket, Ipswich, Suffolk.—The first meeting of creditors was held on July 20th at Ipswich, when the case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. The statement of affairs showed liabilities of £860, against assets of £48, leaving a deficiency of £812.

A. GREIG and J. WISELY (Wireless and Electrical Engineering Co.), 39, Bridge Street, Aberdeen.—The estates of the above debtors were sequestrated by the Sheriff of Aberdeen, Kincardine and Banff on July 10th. A meeting to elect trustees and Commissioners was held on July 24th at the Douglas Hotel, Market Street, Aberdeen. Particulars of claims by November 10th to Mr. W. D. Reed, agent, 2, Albyn Place, Aberdeen.

W. WORSNIP, wireless dealer, 36, Market Hall, Walham Green, S.W.—Receiving order made July 12th, on a creditor's petition. First meeting held July 25th. Public examination October 2nd, both at Carey Street, W.C.

E. D. JONES, electrical engineer, Royal Sportsman Hotel, Portmadoc.—Receiving order made July 12th, on debtor's own petition.

H. PADGETT and A. NICHOLSON (Padgett & Co.), electrical and radio engineers, 218, Springbank, and 10, Beverley Road, Kingston-upon-Hull.—Trustee, Mr. J. E. D. Stickney, Official Receiver, 37, Scale Lane, Hull, released July 5th.

E. WOOLLEY, E. KEABLE and H. J. NASH (T. Woolley), plumbers and electrical engineers, 3, Church Street, Bexhill.—Last day for proofs for dividend July 31st. Trustee, Mr. J. Allcorn, Official Receiver, 12D, Marlborough Place, Brighton.

G. BLADES, electrical engineer, 55, Hainton Avenue, and 52, Pasture Street, Great Grimsby.—Trustee, Mr. J. Fildes, Official Receiver, St. Mary's Chambers, Great Grimsby, released July 12th.

Company Liquidations.

ELECTRICAL SUPPLIES (LIVERPOOL), LTD., electrical and wireless dealers, Liverpool.—In accordance with a resolution passed at the statutory meeting of creditors, Mr. P. S. Booth, Exchange Chambers, 2, Bixteth Street, Liverpool, has been appointed joint liquidator in the voluntary liquidation of the company. The following are creditors:—

	£		£
General Electric Co., Ltd.	1,006	Midland Electric Mfg. Co., Ltd.	46
Greengate and Irwell Rubber Co., Ltd. ...	499	Bailey, Page & Co. ...	46
British Thomson-Houston Co., Ltd.	298	Simplex Conduits, Ltd.	46
Philips Lamps, Ltd. ...	227	Credenda Conduits Co., Ltd.	44
Sanders & Co.	146	Revo Electric Co., Ltd.	41
W. T. Henley's Telegraph Works Co., Ltd.	142	Scandinavian Cable and Rubber Co.	39
Edison Swan Electric Co., Ltd.	120	Tipper Bros.	36
Callender's Cable & Construction Co., Ltd. ...	120	Measurement, Ltd. ...	31
Liverpool Electric Cable Co., Ltd.	114	Tucker & Co., Ltd. ...	30
F. C. Blackwell & Co., Ltd.	69	Pope's Electric Lamp Co., Ltd.	30
Steel Tube & Conduits Co., Ltd.	65	J. Abrahams, Ltd. ...	20
Kerson's Manufacturing Co.	59	Falk, Stadelmann and Co., Ltd.	25
M.K. Electric, Ltd. ...	52	Veritys, Ltd.	24
		Vlies & Benson	28
		Ward & Goldstone, Ltd.	21
		Walsall Hardware Mfg. Co., Ltd.	24

RADIOVISOR, LTD.—Winding up voluntarily. Liquidator, Mr. S. H. Master, 26, Church Street, Cambridge Circus, W.C., who is authorised to carry into effect an agreement between the company, Radiovisor Parent, Ltd., and Mr. J. Neale. A meeting of creditors is called for to-day (Friday) at 26, Coventry Street, W.C. Particulars of claims to the liquidator by August 1st.

CENTURY CABLES, LTD.—Winding up voluntarily. Liquidator, Mr. G. Smith, 137, Victoria Street, S.W.—A meeting of creditors is called for to-day, July 27th, at 19, Bedford Row, W.C.1.

CHURCH STRETTON ELECTRIC SUPPLY CO., LTD.—Particulars of claims by August 20th to the liquidator, Mr. A. E. Dalton.

Dissolution of Partnership.

HILL, UPTON & CO., electrical engineers, 22, George Street, and Radiant House, George Street, Oxford.—Mr. H. J. Butterfield and Mr. W. T. Upton have dissolved partnership. Mr. Butterfield will continue the business under the same style.

New Catalogues and Lists.

FOAMITE FIREFOAM, LTD., 55-57, Great Marlborough Street, W.1.—A booklet entitled "Safeguarding Your Property," dealing with the company's fire-extinguishing system.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Book 5, Section 1c, containing illustrated information regarding the "Pul-syn-etic" system of electric clocks and time-keeping.

THE METROPOLITAN CABLE & CONSTRUCTION CO., LTD., Clyde Works, Chadwell Heath, Essex.—Price lists Nos. 1628 and 2628, dealing respectively with rubber cables and automobile cables.

VOLTA, LTD., Kern House, 36-38, Kingsway, W.C.2.—"The Volta Viewpoint" for July, containing assistance for sellers of the company's vacuum cleaners.

VENNER TIME SWITCHES, LTD., 45, Horseferry Road, S.W.1.—Supplement to List No. 46 containing instructions for setting "Venner" thermostats.

MR. ERIC A. HODGSON, Shirley Road, Nottingham.—An illustrated brochure advertising "Buckeye" electrically-heated and ventilated incubators.

THE EDISON SWAN ELECTRIC CO., LTD., 124, Queen Victoria Street, E.C.4.—A showcard (priced) advertising the company's "Hymeg" h.t. accumulators for radio purposes.

SUPERLAMP, LTD., 92-94, Paul Street, E.C.2.—An illustrated and priced catalogue of "Supaul" electric signs, shop-window lighting fittings, outside lanterns, watertight fittings, &c.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—An illustrated pamphlet announcing reduced prices of the company's Models 22 and 32 receiving sets.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—Descriptive Lists No. 4506, dealing with cell-type oxide-film lightning arrestors; and No. 5185 describing "B.T.-H." unbreakable grid resistances.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A price list of reconditioned motors and an illustrated folder advertising "Brook" motors for factory drives.

THE A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1.—An illustrated and priced catalogue of a.c. motors.

THE LONDON ELECTRIC STORES, LTD., 9, St. Martin's Street, Leicester Square, W.C.2.—A comprehensive catalogue (200 pp.) of electrical supplies and appliances of all kinds and makes, including wiring materials, switchgear, lamps, reflectors, motors, domestic appliances, &c. Fully illustrated and priced.

Unemployment.

The Employment Exchange registers showed a total of 1,242,400 unemployed on July 9th, an increase of 24,920 as compared with July 2nd, and 205,880 as compared with July 11th, 1927.

The Marking of Cables and Lamps.

In our issue of June 1st (p. 949) we reprinted the draft Order-in-Council made under the Merchandise Marks Act, 1926, requiring the marking of electric cables and wires and incandescent electric lamps with the name of their country of origin upon importation. The Order has now been approved by both Houses of Parliament and will come into force on October 13th next so far as cables and wires are concerned, and on January 13th, 1929, in the case of lamps.

Workmen as Directors.

In a recent letter to *The Times*, Mr. G. N. Barnes calls attention to a scheme instituted by Messrs. R. A. Lister and Co., Ltd., on the occasion of their diamond jubilee. They asked their workpeople to nominate a committee of six to sit with the board of directors once a month to discuss all matters relating to the good of the company and of the industry. They act as the mouthpiece of the workers to the company in respect of labour conditions, as well as the mouthpiece of the company back to the workers in matters relating to home and foreign markets. "The members of the committee have, to all intents and purposes, the status of directors, and they are paid the same as other directors for every meeting they attend. They are entitled to ask any questions they like on the business of the firm and experts are called in, if necessary, to answer them. Already, although the scheme has been in operation for only six months, it has proved of great value in giving the directors direct access to the practical knowledge of the man at the bench and in giving to the workers a knowledge of the business on which they depend."

Irish Free State Electrical Imports.

The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports for the whole of the past year, comparing them with 1926. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom, as country of shipment, but not necessarily of manufacture:—

	Total imports.		U.K. share.	
	1927.	1926.	1927.	1926.
	£	£	£	£
Electric wires and cables	109,989	115,545	47,877	62,848
Telegraph and telephone instruments and apparatus ...	36,182	40,430	28,428	35,788
Electric lamps and parts	47,187	56,995	40,879	52,645
Batteries and accumulators	34,248	39,014	31,890	34,575
Radio sets and parts ...	74,613	90,211	72,987	86,085
Other electrical goods and apparatus ...	83,679	108,054	62,560	75,462
Generators	21,830	28,953	13,088	11,665
Motors	17,625	37,822	13,911	21,090
Other electrical machinery	76,084	85,740	62,871	72,966
Totals ...	£501,437	£592,764	£374,491	£453,124

It will be seen that with the exception of batteries and accumulators there was a marked decline in imports, the year's total showing a falling off of £91,327, or nearly 16 per cent. Of the imports £374,491, or nearly 75 per cent., came from ports of the United Kingdom, leaving £126,946 for foreign countries. Of this balance £6,960 is credited to the United States and the remainder to Germany.

A return issued by the Department shows that electrical goods of the country's manufacture to a value of £12,621 were exported from the Free State during last year as compared with £8,364 in 1926.

New French Company.

La Société d'Etudes pour le Transport d'Energie Electrique dans la Région du Nord-Est is the name of a syndicate which has recently been organised in Paris (3, Rue Lamennais) with a capital of 300,000 fr., to draw up plans for a large extension of the electric power supply facilities in North-East France. Representatives of all the important electricity supply undertakings in the area are included in the new syndicate.

New Dutch Company.

An international electrical financing company has been formed in Amsterdam by British (Hambros Bank), American, German, and Dutch financiers. It has a capital of 10,030,000 florins (about £800,000).

For Sale.

Haslingden Borough Council electricity department invites offers for 226 glass cells last used as a storage battery. The Stoke-on-Trent Electrical Engineer's Department has for disposal a 10-kW steam-driven dynamo. (See our advertisement pages to-day.)

Recent Contracts.

The Metropolitan Railway Company has placed an order for the remodelling of its existing boiler plant at Neasden power station. The plant at present consists of 20 stoker-fired boilers, and the new order, which has been placed with INTERNATIONAL COMBUSTION, LTD., will replace these by six boilers of the vertical bent tube "Lopulco" type, fired by the company's bin and feeder system of pulverised fuel firing. For grinding, six 6-ton pulverising mills will be installed. Two of the latest type "R" burners per boiler will be used, and the combustion chamber will be lined with Murray fin tubes on three sides, no cooling being used on the front wall where the burners are installed. The air will be pre-heated with the Underfeed Stoker Company's air heaters superimposed. The boilers will be operated at a pressure of 300 lb. per sq. in., with a normal evaporation of 80,000 lb. per hour, and a maximum of 100,000 lb. per hour, the total temperature being 750 deg. F. The heating surface of each boiler will be 9,050 sq. ft., the heating surface in each combustion chamber being 950 sq. ft. of exposed surface. The plant will also include raw-coal handling equipment and ash handling plant of the sluice type, both by the Underfeed Stoker Company, instruments, piping, dust collectors, induced and forced draught fans, with two motors per fan, and other accessories. The complete buildings are included in the contract, but the foundations will be supplied by the clients. The approximate cost of the complete order is £210,000.

Messrs. SULZER BROS. have recently received an order for an eight-cylinder, two-cycle, 5,000-b.h.p. Diesel engine for the Bucharest Electricity Works. This power station is already equipped with 11 Diesel engines of other makes, ranging in sizes from 240 to 2,000 b.h.p. A 620-b.h.p. Sulzer engine has also been ordered from the company for the electric power station in Jaipur, India. In both cases the engines will be direct coupled to alternators, the larger engine running at 150 r.p.m. and the smaller at 187 r.p.m.

A new d.c. switchboard which has been ordered by the Bermondsey Borough Council from CROMPTON-PARKINSON, LTD., is one of the largest boards installed in this country of late years. Its function is the control of 10,000 kW of 500-V rotary-convertor plant for lighting and traction and contains provision for 2,000 kW of extensions. Some new features are being incorporated in the design.

New Zealand's Electrical Imports.

During the last quarter of 1927 electrical machinery and appliances valued at £496,908 were imported, and it is noteworthy that this is the highest figure given in a list of the Dominion's leading imports by the *Board of Trade Journal*. The bulk of the goods (£278,830) were supplied by the United Kingdom. The United States' share was valued at £99,174; that of Canada at £27,020, and that of Australia at £6,757.

Spanish Duty on Generators.

Under a recent Royal Order, states the *Board of Trade Journal*, when electric generators are imported into Spain with the exciters belonging to them, the generator and exciter are to be regarded as a complete machine, and the Customs duty will be assessed on their total weight, even if they are separate.

Electrical Appliances for Natal.

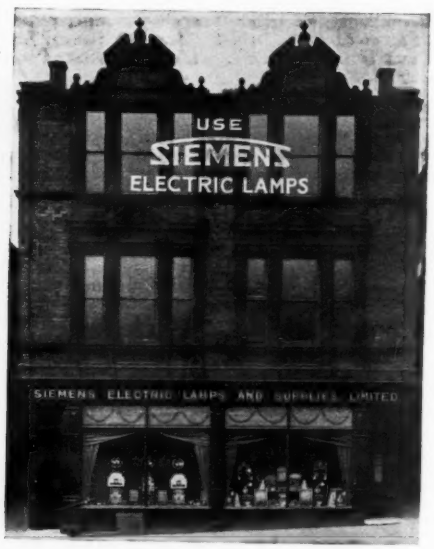
The Department of Overseas Trade has received from the Commissioner at Johannesburg (Mr. J. W. Brigden) a memorandum on the sale of electric heating and cooking appliances in the Durban district. Firms interested in the supply of electrical appliances of United Kingdom manufacture can obtain a copy of the memorandum on application to the Department of Overseas Trade, 35, Old Queen Street, S.W.1. (Reference B.X. 4586.)

New C.M.A. Marks.

The Cable Makers' Association has recently registered two new trade marks to distinguish cables made by its members. One applies to vulcanised india-rubber cable conforming to C.M.A. standards, and its form "Vicma" is indicative of its nature. The other is "Vinazo"—a combination of v.i.r. and "Nonazo," the Association's mark for cables of non-Association standard.

New Siemens Branch at Manchester.

In order to handle the increasing business in the Lancashire, Cheshire, and North Wales area more expeditiously, the branch offices of SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., have been moved to large premises at 10-12, Cateaton Street, Manchester (telephone: Central 7451 and 7452). The



The New Siemens Branch, Manchester.

building comprises well-appointed offices, a showroom, a trade counter and stores. The lamp and general electrical supplies requirements in the area will be well catered for from the new address, where all orders and inquiries in future should be sent.

Trade Announcements.

Messrs. K. Potter and A. Brown have registered a partnership under the style of KENNETH POTTER & Co., electrical engineers and contractors. Their address is Manchester Road, Wilmslow, Ches.

Mr. J. E. M. BOYES has been appointed as representative of B.E.N. Patents, Ltd., in the Midlands, in place of Mr. E. A. Sanders, who has left the company.

Messrs. GIBBS & WHITE, Southampton, have appointed Mr. H. B. Player managing director, and have removed their head office to a more central position at 81a, Above Bar.

Messrs. S. G. ALLEN & SON, electrical engineers, Gravesend, have taken premises in Windmill Street, where offices have been opened by the Corporation Electricity Department, and they will remove there on the completion of the necessary alterations.

The telephone numbers of the G.E.C. RESEARCH LABORATORIES, Wembley, have been altered to Wembley 3162/5.

Messrs. FREDERICK THOMAS & Co., LTD., have moved their showrooms for Newcastle and district to larger premises at 13, Saville Row, Newcastle-on-Tyne (Telephone: Central 6439).

The Sales and Estimating Departments of the MACINTOSH CABLE Co., LTD., have been transferred from St. James's House, S.W.1, to the company's works at Ashbourne Road Mills, Derby. The London Sales Branch remains at Amberley House, Norfolk Street, W.C.2, operated by Messrs. Gillespie and Beales.

The Mexican Electrical Industry.

Reuter reports that prior to General Obregon's death, the National Congress agreed to a special decree granting the new President extraordinary powers to prepare, within six months of his taking office, necessary legislation on the electrical industry.

The Metal Trades Benevolent Society.

The 80th anniversary festival of the Royal Metal Trades Pension and Benevolent Society is to be held at the Hotel Metropole, W.C.2, on October 26th. Particulars can be obtained from the Secretary at 195, Upper Thames Street, E.C.4.

New Indian Company.

A company has been formed in Calcutta (135, Prinsep Street) with a capital of 500,000 rupees and the title the Gauhati Electric Supply Corporation.

Deed of Assignment.

H. G. WESTWOOD, electrical engineer and dealer, High Street, Blackheath.—Particulars of claims by August 4th to the trustee, Mr. F. E. Sidaway, High Street, Blackheath.

New Italian Company.

A new cable manufacturing concern has been formed in Naples with a capital of 100,000 lire and the title La Società Italiana Conduttori Elettrici Ernest Lancellotti.

New Chilean Company.

A company has been formed in Santiago with a capital of two million dollars and the title Transradio Chilena Compania Radio-Telegrafica Limitada, to establish a radio-telegraphy and telephony service in Chile.

Gold Coast Electrical Imports.

The *Board of Trade Journal* shows that during February last the value of electrical and telegraphic apparatus imported into the Gold Coast Colony was £10,526, against £3,013 in February, 1927.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.		Price July 14th.	Fortnight's inc. or dec
a	Acid, Oxalic	per lb.	6¾d.	...
a	Ammoniac, Sal	per ton.	£60	...
a	Ammonia, Muriate (large crystal)	,,	£52	...
a	Bisulphide of Carbon	,,	...	...
a	Borax	,,	£25	...
a	Copper Sulphate	,,	£25 10s.	...
a	Potash, Chlorate	per lb.	3½d. to 4d.	...
a	,, Perchlorate	,,	5½d.	...
a	Shellac	per cwt.	£13 10s.	...
a	Sulphur, Commercial	,,	£11	...
a	,, Roll	,,	£11	...
a	Soda, Chlorate	per lb.	3d.	...
a	,, Crystals	per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks	per lb.	3½d.	...
	METALS, &c.			
b	Aluminium, Ingots	per ton.	£95 to £100	...
b	,, Wire	per lb.	1/3 to 1/9	...
b	,, Sheet	,,	1/8 to 2/0	...
p	Babbitts Metal and Anti-friction Metal—			
	Grade I	per ton net.	£193	£2 inc.
	Grade II	,, ,,	£136	£1 inc.
	Grade III	,, ,,	£73	...
c	Brass (rolled metal 2" to 12" basis)	per lb.	9¾d.	...
c	,, Tubes (solid drawn)	,,	11½d. to 1/-	...
c	,, Wire, basis	,,	9¾d.	...
c	Copper Tubes (solid drawn)	,,	1/1½	1d. inc.
c	,, Bars (best selected)	per ton.	£94	...
c	,, Sheet	,,	£94	...
c	,, Rod	,,	£94	...
d	,, (Electrolytic) Bars	,,	£69 5s.	5/- inc.
d	,, ,, Sheets	,,	£143 10s.	...
d	,, ,, Wire Rods	,,	£79 5s.	5/- inc.
d	,, ,, H.C. Wire	per lb.	9⅛d.	⅛d. inc.
f	Ebonite Rod	,,	2/3 to 2/6	...
f	,, Sheet	,,	2/3 to 2/6	...
n	German Silver Wire	,,	2/9	...
h	Gutta-percha, fine	,,	6/8	...
h	India rubber, Para fine	,,	11¼d.	¼d. inc.
l	Iron Pig (Cleveland No. 3.)	per ton.	65/-	...
l	,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g	Lead, English pig	,,	£21	5/- inc.
g	Mercury	per bot.	£20 17s. 6d. to £21	10/- dec.
e	Mica (in original cases) small	per lb.	3d. to 8/-	...
e	,, ,, medium	,,	4/- to 8/-	...
e	,, ,, large	,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings	,,	1/2½	...
p	,, ,, drawn bars & rods	,,	1/3	...
p	,, ,, rolled strip & sheet	,,	1/2½	...
p	,, ,, wire	,,	1/3½	...
o	Platinum	per oz.	£17 15s.	...
d	Silicium Bronze Wire	per lb.	10½d.	...
r	Steel, Magnet, in bars	,,	7½d.	...
n	Tin, Block (English)	per ton.	£215 to £217	£7 15s. inc.
n	,, Wire, Nos. 1 to 16	per lb.	8/10	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on July 29th, Messrs. James Forster & Co. stated:—"The lead market has been quiet this week, but on the whole firm, support being forthcoming from leading dealers. Opening slightly easier on Monday, prices advanced daily and closed at the best. No further cut has been made in the American price, which remains at 6.20 cents. Demand from consumers continues to be moderate, no signs of any increase in consumption being apparent. Arrivals are ample for the present demand. Over 12,000 tons of lead were shipped from Australia last month destined for this country and the Continent, an increase of nearly 6,000 tons over the previous month. With the usual quantities expected from Mexico, Burma, and Canada, it would appear as if there will be plenty of metal next month for consumptive requirements."

Lighting and Power Notes.

Barnes.—LOAN.—The Lighting Committee of the Urban District Council proposes making application for sanction to borrow £35,000 for the installation of a 3,750-kW turbo-alternator, with boiler, to meet the demands on the undertaking during the winter of 1929.

Birmingham.—YEAR'S WORKING.—We have received from Mr. R. A. Chattock, city electrical engineer, a copy of the statement of accounts of the electricity undertaking covering the year ended March 31st last. The total revenue amounted to £1,577,553, as compared with £1,537,292 in the preceding year. Working expenses were considerably reduced, from £884,104 to £809,939, with a consequent increase in the gross profit from £653,188 to £767,614, to which unemployment grants of £1,544 and bank interest of £3,032 were added, making a total of £772,190 available. Capital and other charges absorbed £559,375, and there was a net profit of £212,815, as compared with £172,755 in 1926-27. For the fifth successive year a contribution of £31,000 was made to the borough rate fund, and the total contributions made since 1909 now amount to £419,491. The capital expenditure during the year amounted to £761,269, the chief items being £160,190 for buildings, £340,826 for machinery and plant, and £260,596 for mains and services. The total expended on the undertaking at the end of the year under review was £8,493,452. The sales of electrical energy increased by 46,761,974 to 280,985,406 kWh, a record for the undertaking, the previous highest increase being approximately 34 millions in 1915-16, during industrial activity on war munitions. The number of lamp connections in 60-watt lamps increased from 916,198 to 1,028,959, and the motor connections in h.p. from 246,233 to 276,332. The average price obtained per kWh fell from 1.575d. to 1.347d. Good progress was made during the year with the constructional work at the Hams Hall power station, and it is anticipated that it will be completed by October, 1929.

Canada.—ELECTRICAL DEVELOPMENT.—The British Columbia Power Corporation has awarded to Messrs. C. C. Moore and Co. a contract for the construction of a steam-power plant at Burrard Inlet, at a cost of $2,500,000. Surveys and test bearings are now practically completed, and engineers will start work immediately on detailed plans of the structure. It is expected that the plant, which will be known as the Hastings steam plant, will be completed by September 1st, 1930. The contract provides for the construction of the first 20,000-kW turbo-generator for the station which will ultimately contain four similar units. The total capacity will reach 105,000 h.p. When the new plant is completed, the company will have a total of six generating plants on the mainland of British Columbia, including the Bridge River hydro-electric power development, on which work is now in progress. With its Jordan River and Coldstream hydro-electric plants on Vancouver Island, and the existing reserve steam plants at Vancouver and Victoria, the Corporation has at present over 200,000 h.p. of developed capacity.

The Canadian Hydro-Electric Corporation expects early in November to be generating 50,000 h.p. at the new Bryson plant of its subsidiary, the Gatineau Power Co., as by that time the additional 25,000-h.p. unit which is now being installed is expected to be ready for operation. The Bryson plant on the Ottawa River is equipped for the installation of three 25,000-h.p. units, one of which is already in operation. The additional power is needed to cope with the increased demand in Ottawa, Hull and district, and the company intends before long to install the third unit.

Continental.—BAVARIA.—Considerable extensions were made during last year by the Bavarian Hydro-Electric Co., and the Central Isar Hydro-Electric Co. The length of the h.p. distribution system was extended from 625 to 750 miles and the capacity of the transformer stations increased to 411,000 kVA. During the year the Isar Co. completed a new hydro-electric power station at Pfrombach, with a capacity of 32,000 h.p.

POLAND.—An official return lately issued shows that the combined capacity of the power stations in Poland amounted at the end of 1927 to 1,130,000 kW, an increase of 25 per cent. during the twelve months.

Croydon.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £18,620 for mains, and £6,782 for plant and additions to buildings.

Dutch East Indies.—HYDRO-ELECTRICAL DEVELOPMENT.—A new hydro-electric power station with an initial capacity of 24,000 h.p. has recently been completed and put in operation at Kali Konto, on the Island of Borneo.

East Anglia.—INQUIRY.—An inquiry was held recently at Norwich Guildhall by Col. T. C. Ekin, for the Electricity Commissioners, into the applications by Norwich, Great Yarmouth, Ipswich, King's Lynn, New Hunstanton, and Mr. F. R. Hunter, of Halesworth, for Special Orders authorising them to supply electricity in certain areas in Norfolk and Suffolk. Objections were raised, and the East Anglian Electricity Supply Co., has submitted to the Commissioners proposals for the development of electricity supply in parts of the area defined in the Act of 1927, and a scheme for the installation of transmission lines. The Commissioners will give their decision in due course.

Fort William.—NEW PLANT.—The Fort William Electric Lighting Co. has completed the installation of a Ruston and Hornsby 165-h.p. oil engine coupled to an E.C.C. 100-kW generator. The new engine and generator are capable of producing double the output of the water turbines at present in use.

Gainsborough.—ELECTRICITY IN BULK.—The Urban District Council has approved an agreement with the Yorkshire Electric Power Co., for the provision of a bulk supply of electricity. The Council will continue to operate its own generating station, but will purchase from the company electricity as required over the amount which the station is capable of generating.

Hastings.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. J. Ryan) for the year ended March 31st last show a total income of £100,699, as compared with £89,417 in 1926-27. Working expenses decreased from £58,354 to £50,190, leaving a gross profit of £50,509, as against £31,063. Capital charges absorbed £39,537, and there was a net surplus of £10,972, as compared with a deficit of £748 in the preceding year. A sum of £2,000 was transferred to the borough fund. The capital expenditure during the year mounted to £88,343, the bulk of which was spent on mains. The electrical energy sold increased from 8,446,263 to 10,574,800 kWh, and the maximum supply demanded from 5,080 to 6,550 kW. Sanction was received during the year to the installation of an additional 6,250-kW turbo-alternator, and one 30,000-lb. boiler, and contracts for this work have been placed.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. S. Black) for the year ended March 31st last show a total income of £132,808, as compared with £133,334 in 1926-27, and working expenditure of £70,818, as against £80,432, leaving a gross profit of £61,990 (£52,901). Capital charges absorbed £18,606, and there was a net surplus of £43,384, as compared with £36,657 in the previous year. A sum of £3,000 was transferred to the borough fund. The net capital expenditure during the year amounted to £77,567, and included £42,986 for machinery, and £20,812 for mains. The electrical energy sold increased from 11,907,358 to 14,439,261 kWh, and the maximum supply demanded from 7,300 to 8,600 kW. A new 6,250 kW set and one 50,000/70,000 lb. boiler were installed during the year. The Installation Department and showroom made satisfactory progress, the total value of the orders executed during the year being £16,286, as compared with £13,902 for 1926-27.

London.—HACKNEY.—*Year's Working.*—The report of the borough electrical engineer (Mr. L. L. Robinson) on the working of the electricity undertaking for the year ended March 31st last shows a total revenue of £239,998, and working expenditure of £114,983, leaving a gross profit of £125,015. The figures for the preceding year were:—Income, £232,111; working expenses, £125,217; gross profit, £106,893. To the gross profit was added revenue from other sources, making a total of £127,321, and after deducting capital and other charges there was a net surplus of £22,214, as compared with £15,645 in the preceding year. A contribution of £8,145 was made to the general rate fund. The capital expenditure during the year amounted to £135,999, and included £37,962 for machinery and plant, and £49,725 for mains and services. The sales of electrical energy increased from 29,343,168 to 34,378,953 kWh, and there was a substantial rise in the maximum supply demanded, from 16,350 to 19,300 kW.

STOKE NEWINGTON.—The Electricity Committee has received from the borough treasurer a copy of the accounts of the electricity undertaking covering the year ended March 31st last. The gross profit was £14,952, and after meeting all charges there was a net surplus of £2,631, of which £1,287 was transferred to reserve. The Committee has recommended that the balance of £1,344 be appropriated for expenditure on meters, free wiring installations, and services.

The approval of the Electricity Commissioners and the London and Home Counties Joint Electricity Authority has been received to the terms of the agreement with the Hackney Borough Council for the supply of electricity in bulk to Stoke Newington as from April 1st last.

LONDON COUNTY COUNCIL.—The Highways Committee has approved of the proposals of the Kensington and Knightsbridge Electric Lighting Co., Ltd., and the St. James' and Pall Mall Electric Lighting Co., Ltd., to change over their d.c. supply to a.c. at 230 and 400 V. In connection with the application of the St. Marylebone Borough Council to the adoption of an a.c. supply at 240 and 415 V, the Committee has approached the Council with a view to its application being amended so as to provide for pressures of 230 and 400 V.

Loughborough.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer: Mr. G. J. Hollyer) for the year ended March 31st last shows a total income of £47,935, as compared with £40,747 in 1926-27. Working expenses amount to £27,912, as against £31,363, and after deducting capital charges there was a net profit of £2,529, as compared with a loss of £7,673 in the preceding year. The sales of electricity increased from 4,830,399 to 5,703,263 kWh.

Manchester.—PROGRESS DURING MAY.—During the month of May the Corporation electricity undertaking showed an increase in connections of 2,773 kW, bringing the total up to

355,775 kW; and the number of applications received for supply, including existing consumers for additional supplies, was 958, representing a total of 2,698 kW. The number of hired cookers connected increased by 110, bringing the total actually on circuit to 4,501. Applications for the hire of cookers totalled 96. Two 750-kVA transformers were put into commission at the sub-station at McConnel's Mill.

Malvern.—NEW CHARGES.—The Urban District Council has adopted a new scale of electricity charges for lighting varying from 7d. per kWh for the first 200 kWh per quarter to 4½d. for over 2,000 kWh.

Northern Ireland. — BELFAST.—*Year's Working.* — The accounts of the city electricity undertaking (engineer: Mr. F. H. Whysall) for the year ended March 31st last show a total revenue of £380,749, as compared with £379,683 for the previous year. The total working expenses amounted to £147,985, as against £183,079, leaving a gross balance of £232,764 (£196,604). The deduction of capital charges, &c., leaves a net profit of £79,420, as compared with £46,421 for the preceding year. The electricity sold increased from 44,755,823 to 56,212,857 kWh. The total connected load (excluding tramways) was 65,501 kW, an increase of 5,959 kW, as compared with the previous year. The piling, foundations and building in connection with the extensions at the Harbour power station were sufficiently advanced for the installation of the new plant, and the turbo-alternator, condenser, and auxiliary plant have been delivered and are in course of erection.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LOWESTOFT.—Lighting: From 7½d. to 7d. per kWh, with a discount of 2½ per cent. for prompt payment of accounts. Heating: From 3d. to 1½d. per kWh.

LIVERPOOL.—In the urban districts of Waterloo-with-Seaforth and Great Crosby.—Lighting: A reduction of ½d. per kWh as from April 1st, 1929; ½d. per kWh, as from April 1st, 1931; and ½d. per kWh as from April 1st, 1934.

CROYDON.—Lighting: From 6½d. to 6¼d. per kWh. Heating: From 1½d. to 1¼d. per kWh.

TAUNTON.—Lighting: Under 500 kWh per quarter, from 6d. to 5d. per kWh; under 1,000 kWh, from 5d. to 4d. per kWh; over 1,000 kWh, from 4d. to 3d. Heating: From 1½d. to 1d. per kWh. Power: First 2,000 kWh per quarter, from 2½d. to 2d. per kWh; next 2,000 kWh, from 2d. to 1½d.; over 4,000 kWh, from 1½d. to 1¼d. All energy in excess of 32,000 kWh per annum, 1d. per kWh.

FULHAM.—Lighting: Ordinary meters, from 4d. to 3½d. per kWh; slot meters, from 4½d. to 4d. per kWh. Power: From 1d. to ½d. per kWh. KW supplies: From £4 to £3 10s. per kW. Public lighting: From 1d. to ½d. per kWh. The Electricity Committee has recommended the following new scale for the daylight lighting of business premises: 1 5/16d. per kWh, plus 12s. 6d. per quarter for time switch.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the Liverpool Corporation authorising it to erect a generating station at Clarence Dock; and the Leicestershire and Warwickshire Electric Power Co., to supply electricity in parts of the rural districts of Stratford-on-Avon and Warwick.

The Commissioners have submitted to the Minister of Transport for confirmation, a Special Order made by them authorising Louth Corporation to supply electricity in its area.

Swansea.—ELECTRICITY SUPPLY.—At a recent meeting of the Corporation Electricity Committee, the borough electrical engineer reported that the Amman Anthracite Collieries, Ltd., had applied for a supply of electricity in bulk to the Amman Colliery, Amman Valley, and it was decided to give a supply at an estimated cost of £2,625.

Taunton.—YEAR'S WORKING.—The borough electrical engineer (Mr. A. J. Howard) reports that the total revenue of the electricity undertaking for the year ended March 31st last was £27,936, as compared with £28,526 in the previous year. Working expenses amounted to £16,665, as against £17,765, and after payment of capital charges (£6,304), there was a net surplus of £4,967, as against £1,908 in 1926-27. Mr. Howard states that although the load factor is only 23.4 per cent. the fuel consumption was as low as 3.15 lb. per kWh sold.

LOANS SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing by the Town Council of £12,500 for mains and services; and £1,500 for meters.

Walsall.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. H. A. Howie) for the year ended March 31st last record a total income of £121,920, as compared with £117,501 in the preceding year. Working expenses amounted to £69,998, as against £72,858, leaving a gross profit of £51,922 (£44,643). After payment of capital charges there was a net profit of £15,476, as compared with £7,823 in 1926-27. A sum of £4,900 was transferred to the borough fund. Additional capital expenditure during the year amounted to £89,584, making a total of £609,380. There were, however, transactions on capital account in connection with the West Midlands Joint Electricity Authority, including transfer value of the generating station amounting to £250,834, and the net capital outlay at the end of the year was £358,546, the net debt being £158,612. The electrical energy sold increased from 16,334,745 to 17,193,725 kWh, and the average price obtained per kWh fell from 1.73d. to 1.70d.

Tramway and Railway Notes.

Continental.—SPAIN.—A Royal Order, dated April 27th, 1928, has granted a prominent engineer of Barcelona the concession to build and operate a subway between Barcelona and Badalona. The construction is to be completed within four years, at an estimated cost of 50,000,000 pesetas.

PYRENEAN RAILWAY.—The new electric railway through the Pyrenees from Pau to Saragossa was formally inaugurated by King Alfonso and President Doumergue, on July 18th. The new line is 20 miles in length, and rises from 1,225 ft. at Bedous to over 3,700 ft. in the tunnel under the Col de Somport.

FRANCE.—During last year the Orleans Railway Company completed the installation of a 90,000-V transmission line between Coindre and Maneges, and a 150,000-V line between Eguzon and Chaingy. Work is now in hand on the erection of a 150/220,000-V line between Maneges and Eguzon. On the electrified lines of its railway system the power used in 1927 amounted to 109 million kWh, of which 70 per cent. was supplied from hydro-electric power stations.

AUSTRIA.—The report of the experts on the question of abandoning or continuing the electrification of the Austrian State Railways has now been published. The experts are divided in their opinions, a majority estimating that the electrification scheme would involve an annual loss of 925,000 schillings, as compared with steam power, while a minority of the experts estimates this loss at as much as 2,425,000 schillings. The majority report deprecates any lengthy interruption in the work of carrying out the electrification scheme, while the minority are in favour of a temporary suspension of the work after the completion of the lines now under construction.

Croydon.—LOAN SANCTIONED.—The Corporation Tramways Committee has obtained sanction to borrow £7,376 for doubling the tramway in High Street.

Ipswich.—YEAR'S WORKING.—The report of the manager of the Corporation transport undertaking (Mr. A. S. Black) for the year ended March 31st last covers the first full year of an entire service of railless cars. The total revenue amounted to £56,663, and working expenses were £43,945, leaving a gross profit of £12,718. The preceding year's figures were: Income, £40,538; working expenses, £35,802; gross profit, £4,736. Capital charges and appropriations for other purposes absorbed £14,078, and there was a net deficit of £1,360, as compared with a loss of £6,428 in the previous year. The number of passengers carried was £10,248,078, as compared with 6,928,831 for the combined services in 1926-27, and the car miles run increased from 800,254 to 1,082,147. The total revenue per car mile rose from 12.157d. to 12.567d.

London.—TRAMWAY SUBWAY.—The Highways Committee of the L.C.C. has recommended that the capital estimate of £326,500 in respect of the enlargement of the tramway subway from the Victoria Embankment to Southampton Row, the conversion of 50 single-deck tramcars to double-deck cars for use in the subway, and the reconstruction of track in the subway, be approved, and that an estimated capital expenditure of £25,600 during the year 1928-29 for the above purposes also be sanctioned.

United States.—CLEVELAND.—The *Electric Railway Journal* reports that the "penny subway" proposal, first broached two years ago, has come to the front again in Cleveland, Ohio. Mr. R. Cragin, author of the plan, announced recently that financing is assured, and he has submitted to the City Council an ordinance authorising the Cleveland Subway Company to build subways to cost $30,000,000, to be operated by the Cleveland Railway when complete. The name "penny subway" is derived from the method of financing. The plan is to allot 1 cent out of each car fare paid the Cleveland Railway for the next 35 years to a fund to pay 6 per cent. interest on the $30,000,000 bond issue and at the same time amortize the principal. Subway routes provided in the Cragin ordinance are: Two-track subway in Superior Avenue Northwest, connecting with the lower deck of the Detroit-Superior high level bridge and looping under the Public Square. Four-track subway in Superior Avenue Northwest, starting at East Twelfth Street and with two loops under the Public Square. Two-track subway connecting with the East Superior subway at Payne Avenue Northeast, entering Chester Avenue Northeast at East Thirteenth Street and proceeding east under Chester and the proposed Chester extension, connecting with Euclid Avenue surface tracks at University Circle. If sufficient balance is left in the $30,000,000 fund when these units are built, the following lines will be built under the ordinance: Two-track subway in Ontario Street from Woodland Avenue Southeast to the Public Square. Two-track subway in West 25th Street from the high level deck of the Detroit-Superior high level bridge to a point south of Lorain Avenue, with a branch in Lorain Avenue to a point beyond West 28th Street. The profits of the Cleveland Subway Company are to be derived from two sources—advertising concessions in the subway stations and the difference between the rate at which it can borrow money and the 6 per cent. charge which is to be met by the passengers out of fares.

Telegraph and Telephone Notes.

Argentina.—RADIO-TELEPHONY.—The Rio de la Plata Telephone and Telegraph Company, of Buenos Aires, is about to extend its wireless telephone system to Santa Fé and Paraná, in Argentina, and to Montevideo, in Uruguay. The Buenos Aires station transmits on a 10,000-metre wave and receives on a wave of 17,629 metres, while the Rosario station is adjusted reversely. A recent test of high-frequency telephone communication between Buenos Aires and Rosario is said to have given highly successful results.—*Reuter's Trade Service* (Buenos Aires).

Central America.—TELEGRAPH AGREEMENT.—An agreement has been concluded between the three Latin-American Governments of Honduras, Mexico and El Salvador for the establishment of an international telegraph service. The Honduras National Congress has already approved of the measure, and the two other States are expected to record their sanction without delay.—*Reuter's Trade Service* (San Salvador).

Imperial Communication.—CANADIAN ATTITUDE.—It is understood that Canada is objecting obstinately to the recommendations of the Imperial Conference on means of communication within the Empire. The British Prime Minister is being pressed to give an undertaking that no agreement will be signed before the British House of Commons has had an opportunity of discussing the proposals. Such a promise, if given, will mean that no decision respecting the recommended merging of submarine cable and radio telegraph interests can be arrived at until November, 1928.

International Telephony.—SWITZERLAND.—International telephony has made immense strides since the war, and owing to her central position Switzerland is vitally interested in the subject. In 1914 the longest Continental telephone line was that of Berlin-Milan, some 1,340 kilometres, of which 300 were on Swiss territory, and, like other lines, it was cut at the outbreak of hostilities. Since those troubled days, various conferences have been held, mostly in Paris, with a view to increasing telephone facilities in Europe, and, as a result,, Switzerland found herself face to face with two problems: one to ensure clearness of communication, the other to increase the number of her existing lines. The ever-growing electrification of her railways forced Switzerland to acknowledge that it was no longer possible to carry telephone messages on circuits running parallel to the electrified railway lines, nor was it possible to divert aerial telephone wires on to private ground, or territory protected by the Nature Protection League of the country. Switzerland set to work and placed her telephone cables underground, and no time was lost in arranging with Germany for a line from Bâle to Frankfort, which was followed in 1926 by the very important circuit to Paris, *viâ* Bâle-Mulhouse-Nancy, which brought into being the long-desired means of telephone communication with London. At the same time arrangements were made with Austria providing for an underground cable between Switzerland, Innsbruck and Vienna; this line has only just been finished, and joins the St. Gall cable at Oberriet; it has been in working order for the last few weeks, and forms the transit link between Eastern and Western Europe. The transit link between Northern and Southern Europe is also being speeded up in Switzerland. By agreements in 1926 and 1927, respectively, Germany and Italy undertook to lay cables on their sides of the frontier. The German cable is nearly finished and runs between Stuttgart and the Swiss frontier, near Schaffhouse; the Swiss part of the work is ready for exploitation. Italy has promised to provide a cable by January, 1929, from Milan to Chiasich, which the Swiss Government will extend to Zurich, joining it to the existing Zurich-Stuttgart line. Switzerland has nearly terminated her part of the job, and in any case will be ready in January of next year as agreed. As soon as the Italian Milan-Domodossola-Iselle circuit is finished that cable will be linked with the Swiss line at Brigue, and French Switzerland will be in direct touch with Italy, while, on its completion, the French Paris-Dijon-Lyon line will be prolonged to Geneva, so that Lausanne will become a very important junction for international telephony between the two Latin countries, as Zurich is for Germany and the other northern countries. Those Swiss business men who have telephoned to Vienna, Berlin, Paris, London, Prague, Oslo, Copenhagen or Amsterdam are unanimous in their praise of the clearness and quickness of communication, and during the recent Olympic Games at Amsterdam (and also at St. Moritz this winter) journalists who used the international lines were more than content with the results obtained. There is no reason why the general public should not put Swiss cables to more general use, and it is to the interest of everyone concerned that the telephone should be employed by them as freely as it is to-day by bankers and merchants, all over Europe, who are in the habit of telephoning, *viâ* Switzerland at all hours of the day or night. The rare difficulties still existing with regard to communication with Czecho-Slovakia, Italy, or Denmark, will shortly be things of the past, and there is every reason to hope that Poland and Jugo-Slavia will ere long see their way to establish international lines in their countries.

Marine Radio Beacons.—NEW STATIONS.—The installation of wireless beacon stations round the coasts of the British Isles is proceeding rapidly. The Marconi Company has already erected six stations, which are now in operation, and seven more have been ordered. Among those now in operation, the Mersey Bar, Coningbeg, and Spurn stations are on lightships, while those at the Skerries, Round Island and the Casquets are on land. The next seven stations to be erected, for which apparatus is now being constructed, are at Start Point, Lundy Island, Sule Skerry, Dungeness, South Bishop, Kinnaird Head, and Cromer; beacon transmitters are projected also for Tory Island and Mizen Head. By the provision of submarine signalling apparatus in conjunction with a wireless transmitter, simultaneous signals can be transmitted in two different media; this system is used at the Spurn and Coningbeg light vessels. Since the speed of propagation of wireless signals is practically instantaneous, while that of submarine signals is approximately 0.8 sea mile per second, the two signals are heard at different moments, the time elapsing between the receipt of the wireless and submarine signals being a measure of the observer's distance from the transmitting station. To obviate the necessity of timing the interval a special system has been evolved in which the synchronised wireless signal is followed by wireless dots spaced 1.25 seconds apart, so that the observer has only to count the number of dots he hears on the wireless receiver up to the time he hears the commencement of the submarine signal; the number gives the distance, in sea miles, the observer is from the transmitter. In order to facilitate reception of wireless and submarine signals one side of the head telephone receivers is connected to the wireless receiver and the other to the submarine signal receiver. The use of a direction finder also enables a determination of position to be made with the aid of a single signalling station.

Nicaragua.—NEW WIRELESS STATION.—A concession has been granted to the Tropical Radio Company, a Boston concern associated with the United Fruit Company, for the erection of a radio station at Puerto Cabezas.—*Reuter's Trade Service* (Managua).

Radio Notes.

Dominican Republic.—NEW STATION.—A powerful radio station (call letters HIA-HIZ) has been erected in Santo Domingo, the capital of the Republic, at the mouth of the Ozama River. The station is able to broadcast on a wavelength of 450 metres and preliminary tests have shown that it can be heard in South America and Canada as well as at nearer places.—*Reuter's Trade Service* (Santo Domingo).

Germany.—LICENCES.—The number of subscribers to the broadcasting service increased during the second quarter of the year by 49,576; the total on July 1st was 2,284,248.

Emission of Rays by Plant Cells.

The discovery that the apex of certain rapidly growing vegetable and animal tissues emits some sort of invisible radiation which has the power to stimulate the growth of living matter with which it is not in contact was first announced in 1924 by Professor Alexander Gurwitch, of Moscow; it has now been confirmed by German investigators. Gurwitch found that if the tip of one of the rootlets of an onion or turnip was fixed so as to point at right angles to the side of another root, though as much as a quarter of an inch away, the cells in the side nearest to the tip would multiply more rapidly than elsewhere and so bend the root away. That this influence was not due to the emission of some gaseous emanation from the root tip was proved by the interposition of a thin sheet between the two roots. Glass and gelatin sheets stopped the transmission of the growth-stimulating power, but quartz did not. This is characteristic of ultra-violet rays, and Gurwitch concluded that the radiation from the root tips had a wavelength of 180-200 millimicrons, which would place it among the ultra-violet rays of high frequency.

A German botanist, Herr N. Wagner, has repeated the experiments and measured the effect by counting under a microscope the number of new cells produced in the roots acted upon. The increase is as high as 70 per cent. in some cases. Old cells that have ceased growing show the greatest relative increase. The Siemens Electrical Company has taken up the question, and Doctors Hauser and Vahle report that certain growing animal tissues, such as cancer, emit such rays.

These results, if confirmed, will radically revolutionise present theories of life and growth. It has hitherto been assumed that the impulse to cell subdivision was somehow due to the direct contact of certain chemical substances transmitted through the tissues, but it now seems that an energy agency is active in vital processes, an immaterial radiation of the nature of light, but at too high a frequency to be detected by human eyes.—*Science.*

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Atherton.—July 31st. Urban District Council. E.h.p. cable. (July 13th.)

Blackpool.—August 1st. Corporation. Electrically-driven centrifugal pumps for sewage pumping. Mr. F. Wood, borough engineer.

Chadderton.—Urban District Council. Electric lighting installations at Stanley Road and Eustace Street schools. Particulars from Mr. A. W. Cox, surveyor to U.D.C., Town Hall.

Cheadle and Gatley.—August 3rd. Electricity Department. One switchgear and transformer kiosk. Specification, &c. (£1 1s. deposit) from Mr. R. W. Willis, engineer and manager, 37, High Street, Cheadle.

Dundee.—August 13th. Corporation. Electric lighting installation at Ashludie Sanatorium (Administrative Block). Specifications, &c. (deposit 2 guineas) from City Engineer.

Egypt.—CAIRO.—October 3rd. General Management. Telephone trunk cable, Cairo-Alexandria. Specifications from Chief Inspecting Engineer, London, S.W.

Glasgow.—July 30th. Corporation. Installation of electric light, telephones, and fire alarms for two new wards at Knightswood Hospital. Specifications, &c., from Office of Public Works, 249, George Street.

Halifax.—July 30th. Town Council. Electrician's work (wiring only) in erection of 94 houses, Moor End. Specifications (£2 2s. deposit) from Borough Engineer, Crossley Street.

India.—MADRAS.—August 14th. Madras and Southern Mahratta Railway Co., Ltd. A.c. motors and starting pillars, paper cables, terminal and joint boxes, rubber cables. (July 20th.)

Irish Free State.—DUBLIN.—August 14th. Electricity Supply Board. Overhead and underground distribution mains and services for Blackrock, Booterstown, Monkstown, Sandycove, and Dalkey. (July 20th.)

WATERFORD.—Aug 1st 3rd. Corporation. 10,000-V and 400-V 3-phase and 200-V d.c. switchgear. (July 6th.)

London.—METROPOLITAN ASYLUMS BOARD.—August 22nd. Rewiring fire-alarm system at Caterham Mental Hospital. Installation of electric lighting in shore and pier buildings, Long Reach Hospital, Dartford, Kent. (July 20th.)

H.M. OFFICE OF WORKS. August 16th. Steam boiler and feed pumps, &c., at the Forest Products Research Laboratory, Princes Risborough.

Lourenco Marques.—August 30th. Ports and Railways Administration. Electrolytic copper cable, r.i. copper wire, &c. (B.X. 4565.)*

Llantarnam.—September 3rd. Urban District Council. H.p. and l.p. switchgear, transformers, and overhead and underground mains. (See this issue.)

Manchester. — August 14th. Tramways Committee. Sand-drying plant. Specification and form (deposit £1 1s.) from Mr. H. Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand.—WELLINGTON.—September 11th. Public Works Department. Two 10-cwt. electric travelling indoor cranes. (A.X. 6545.)*

October 30th. Protective relay system. (B.X. 4573.)*

September 4th. Insulating tape. (B.X. 4572.)*

September 25th. Meter-testing equipment for Lake Coleridge. (B.X. 4570.)*

July 31st. Motor-generator for Seacliff Mental Hospital. (B.X. 4571.)*

Portland.—August 15th. Urban District Council. Mains, transformers, and meters. (July 20th.)

Renfrewshire.—August 3rd. Education Authority. Electric lighting installation at new school, Paisley. Schedules (deposit of £1) from Executive Officer, County Education Offices, 16, Glasgow Road, Paisley.

Ripon.—August 14th. Electricity Department. Transformers, e.h.p. and l.p. switchgear and cable connections. (July 20th.)

Salford.—August 13th. Electricity Department. One 20,000-kW turbo-generator set with condenser and auxiliaries. (July 13th.)

August 13th. Electricity Department. Two water-tube boilers with stokers, fans, motors, preheaters, &c. (July 20th.)

South Africa.—JOHANNESBURG.—September 11th. Rand Water Board. Turbo-generator for the Vaal River scheme. (B.X. 4585.)*

August 30th. Town Council. Street-lighting time switches. (B.X. 4584.)*

Stretford.—August 16th. Electricity Department. 9,200 yd. 33,000 V cables. (See this issue.)

Uruguay.—MONTEVIDEO.—August 22nd. State Electricity Department. Gasfilled metal-filament lamps. (B.X. 4560.)*

September 10th. 338,000 metres of insulated conductors for outdoor use (Hackethal type). (See this issue.)

September 3rd. 155,000 metres of r.i. cords for indoor installations. (B.X. 4590.)*

Warrington. — July 30th. Electricity Department. 12 months' supply of e.h.p. and l.p. cables; e.h.p. sub-station switchgear, and 12 months' supply of reinforced-concrete cable protector slabs, tiles and hard-burned red tiles. (July 13th.)

Willesden.—July 30th. Board of Guardians. New boiler and two 90-kW direct-coupled generating sets for the Park Royal Hospital. (July 20th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bedford.—Electricity Committee. Accepted:—
Cables (£120).—Siemens Bros. & Co., Ltd.
Insulated copper strip (£187).—C. A. Parsons & Co., Ltd.
Hotwell tank (£205).—W. H. Allen, Sons & Co., Ltd.
E.h.p. switchgear (£279).—British Thomson-Houston Co., Ltd. L.p. switchgear (£134).—J. G. Statter & Co., Ltd.

Bournemouth.—Pavilion Committee. Accepted:—
Electric lighting fittings for new pavilion (£3,000).—Aish and Co.

Croydon.—Electricity Committee. Accepted:—
Motor generator set:—

METROPOLITAN-VICKERS ELECTRICAL CO., LTD. (accepted)	£575
English Electric Co., Ltd.	591
Mather & Platt, Ltd.	626
British Thomson-Houston Co., Ltd.	672

Education Committee. Accepted:—
Instalation of electric lighting at Davidson School (£258).—Kingsdown Electrical Co.

Dundee.—The Electricity Committee at the last meeting considered tenders for five types of electric cable. The total of foreign offers amounted to £2,067, while the lowest British quotation was £2,491. Two foreign offers, which were 20 per cent. and 23 per cent. lower than the British, were accepted. In regard to the other three, the British offers, which were only slightly higher, were accepted. The Convener said it was evident the British manufacturers were becoming alive to the position, and were endeavouring to get as near as possible to the foreign price.

Glasgow.—Housing Committee. Recommended:—
Electrical installations for 36 houses at Westmuir Street (£165).—A. Robertson.

Government Contracts.—The following contracts were placed by Government Departments during June:—
ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Rewinding and repairing motor-alternators.—Small Electric Motors, Ltd.
Tuner amplifiers (w./t.).—Radio Instruments, Ltd.
Wireless-telegraph apparatus.—Marconi's Wireless Telegraph Co., Ltd.
Junction boxes.—Engineering and Lighting Equipment Co., Ltd.; L. Weekes (Luton), Ltd.
Electric cables.—Greenwich Cable Works, Ltd.; Johnson and Phillips, Ltd.
Ship ventilating fans.—Bull Motors, Ltd.; Electromotors, Ltd.; Veritys, Ltd.
Wireless-telegraph fittings.—General Electric Co., Ltd.; Highton & Son, Ltd.; Mechans, Ltd.
Electrical installation.—Johnson & Phillips, Ltd.
Motors.—Metropolitan-Vickers Electrical Co., Ltd.
Fuse panels.—Engineering & Lighting Equipment Co., Ltd.; Bertram Thomas.
Radio valves.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.

WAR OFFICE.
Generators.—Newton Bros. (Derby), Ltd.
Rotary transformers, &c.—W. Mackie & Co., Ltd.

AIR MINISTRY.
Accumulators.—Fuller Accumulator Co., Ltd.; Oldham and Sons, Ltd.
Ammeters.—E. Turner.
Bands, d.f.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Batteries.—Edison Swan Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Rewinding fans and motors.—Davidson & Co., Ltd.
Electric cable.—Siemens Bros. & Co., Ltd.
Mobile cranes.—Ransomes & Rapier, Ltd.
Generators and spares.—Newton Bros. (Derby), Ltd.; Mortley, Sprague & Co., Ltd.; W. Mackie & Co., Ltd.
Motor-generators.—Small Electric Motors, Ltd.
Switch boxes.—Plessey Co., Ltd.
Voltmeters.—Everett, Edgcumbe & Co., Ltd.

POST OFFICE.
Protective apparatus.—Telephone Mfg. Co., Ltd.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. and Co., Ltd.; Standard Telephones & Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; Telegraph Condenser Co., Ltd.
Testing apparatus.—Evershed & Vignoles, Ltd.
Terminal blocks.—Thos. de la Rue & Co., Ltd.; Ebonestos Insulators, Ltd.
Coin-collecting boxes.—Hall Telephone Accessories (1928), Ltd.
Cable (various).—Callender's Cable & Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; Hackbridge Cable Co., Ltd.; Johnson and Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.
Earth clips.—Edwin Showell & Sons, Ltd.
Compound.—W. H. Keys, Ltd.; Dussek Bros. & Co., Ltd.; Wilkins, Campbell & Co., Ltd.
Dynamotors.—Walter Jones & Co., Ltd.
Earthenware ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe & Fire Brick Co., Ltd.; Doulton and Co., Ltd.; Jas. Oakes & Co., Ltd.; Oates & Green, Ltd.; Jos. Place & Sons, Ltd.; Standard Brick and Terra Cotta Co., Ltd.; Sutton & Co. (Overseal), Ltd.
Fibre ducts.—Key Engineering Co., Ltd.
Earth plates.—Bullers, Ltd.
Lead sleeves.—Geo. Farmiloe & Sons, Ltd.; Lead Pipes, Ltd.; J. D. Stoward & Co., Ltd.
Electric vans.—Electromobile, Ltd.
Covered wire.—British Insulated Cables, Ltd.
Leclanché rod zincs.—Eyre Smelting Co., Ltd.
Electric lift (Middlesbrough P.O.).—Keighley Electrical Engineering Co., Ltd.
L.p. switchboard (Manchester Central Exchange).—J. G. Statter & Co.
Switchboards (Leafield radio station).—Crompton-Parkinson, Ltd.
Telephone exchange equipment.—Macaulay: General Electric Co., Ltd. (Sub-contractors: Crompton-Parkinson, Ltd., for machines; D.P. Battery Co., Ltd., for batteries). Addiscombe: Siemens Bros. & Co., Ltd. (Sub-contractors: Newton Bros. (Derby), Ltd., for charging machines; Crompton-Parkinson, Ltd., for ringing machines; D.P. Battery Co., Ltd., for batteries.) Kirkcaldy: Siemens Bros. & Co., Ltd.
Telephone-repeater equipment (4-wire).—Standard Telephones & Cables, Ltd.

CROWN AGENTS FOR THE COLONIES.
Cables.—W. T. Henley's Telegraph Works Co., Ltd.; Callender's Cable & Construction Co., Ltd.; Macintosh Cable Co., Ltd.; British Insulated Cables, Ltd.
Fans.—Metro-Vick Supplies, Ltd.
Generating plant.—Petters, Ltd.
Accumulator plates.—D.P. Battery Co., Ltd.
Signalling apparatus.—Railway Signal Co., Ltd.
Telephone apparatus.—Ericsson Telephones, Ltd.; Siemens Bros. & Co., Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.

H.M. OFFICE OF WORKS.
Wiring, &c., Broadmoor, Berks., Asylum.—T. Clarke and Co., Ltd.
Lift (Manchester telephone exchange).—J. Shaw & Sons (Salford), Ltd.

Irish Free State.—DUBLIN.—Department of Posts and Telegraphs.
Ducts.—Cosgrave & Co.
Sections for cells.—Pritchett & Gold & E.P.S. Co., Ltd.
Enamelled and flameproof wire.—W. T. Henley's Telegraph Works Co., Ltd.
G.i. wire.—W. F. Dennis & Co.

Kilmarnock.—Town Council. Accepted:—
Electric lighting installations at housing schemes.—W. Johnstone & Son.

London.—LONDON COUNTY COUNCIL.—Accepted:—
Steam jet air ejectors in place of old turbine-driven air pumps at Greenwich power station (£2,049).—Metropolitan-Vickers Electrical Co., Ltd.
Electrodes.—Quasi-Arc Co., Ltd.
Machined bronze bearings.—Anti-Attrition Metal Co., Ltd.
Four portable motor generators.—Crompton-Parkinson, Ltd.
500 driving-wheel centres.—John Baker & Co. (Rotherham), Ltd.
One steel underframe and body frame structure for experimental tramcar (£292).—Hurst, Nelson & Co., Ltd.

PORT OF LONDON AUTHORITY.
Six months' supply of vacuum lamps.—Siemens Electric Lamps & Supplies, Ltd.

WAR OFFICE.—Accepted:—
Part contract for the supply of electric lamps for 12 months.—Stella Lamp Co., Ltd.

HACKNEY.—Works Committee:—
Renewal of batteries of 19 electric vehicles.—Chloride Electrical Storage Co., Ltd.

METROPOLITAN WATER BOARD. Recommended:—
Electric lamps.—General Electric Co., Ltd., and Stella Lamp Co., Ltd.
New internal telephone system for the accountant's department, head offices:—

BARLOW BROS. & Co. (recommended)	£278
A. Dean & Co., Ltd.	284
Girdlestone & Co.	294
Troughton & Young, Ltd.	308
Duncan Watson & Co.	324

ST. MARYLEBONE.—Electric Supply Committee.
Two 1,200-amp. switches (£938).—Ferguson, Pailin, Ltd. (recommended).

HAMMERSMITH.—Electricity Committee.
Relining of the rotary coal dryer of the powdered fuel plant (£130).—Mechans, Ltd. (accepted).
1,000 yd. l.p. twin cable (£97).—Greenwich Cable Works, Ltd. (accepted).
Two 1,000-kVA Scott-connected transformers (£690).—Hackbridge Electric Construction Co., Ltd.
Two 1,000-kVA Scott-connected transformers (£885), six 250-kVA (£1,437) and six 150-kVA (£954) single-phase transformers.—British Electric Transformer Co., Ltd. (recommended).
One three-phase, 6,600-V e.h.p. and one two-phase, 2,200-V h.p. truck type oil switch panels (£390).—Ferguson, Pailin & Co. (recommended).
40 h.p. single-phase switches (£612).—J. G. Statter & Co. (recommended).

Margate.—Borough Council. Accepted:—
Electrical installation at new public conveniences.—E. A. Pinto.

Mytholmroyd.—
Installing electric lighting at St. Michael's Church.—J. Hunter & Co.

Ramsgate.—Borough Council. Accepted:—
Electric lighting, bells and power installations at new police station, mortuary, and ambulance station.—E. A. Pinto.

Southend-on-Sea.—Town Council. Accepted:—
One mile of overhead trolley wire at 1s. 1½d. per lb.—Equipment & Engineering Co., Ltd.

Woking.—Housing Committee. Recommended:—
Electric light installations at Council houses at Anchor Hill (£8 15s. per house, for eight points).—Woking Electric Supply Co., Ltd.

Forthcoming Event.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, July 31st. South Wales Institute of Engineers, Cardiff. Meeting with the Colliery Managers' Association. "Mine Haulage Signalling Systems." Mr. S. W. Richards.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

CROYDEX rubber gloves.

Switchgear believed to be of Continental origin and marked only with the letters "N.E.S."

Notes.

Sydney Bribery Charges.

The hearing was commenced in Sydney this week of the charges against Mr. S. Y. Maling of receiving bribes in connection with a power-plant contract while he was deputy manager of the Sydney Municipal Electricity Department. The case has arisen out of an inquiry by a Royal Commission, which has been reported in past issues, and former members of the City Council are also involved.

Mines Research Report.

The sixth annual report of the Safety in Mines Research Board for the year ended March 31st last has just been issued (H. M. Stationery Office, price 9d. net). The working expenses of the Board for the year amounted to £52,718, which included eight grants made to other research organisations and research workers. As in previous years, the study of flame-proof electrical machinery was confined to the examination of such apparatus as was submitted for test to the Mining Department of the University of Sheffield, and the examinations were made in collaboration with an investigator appointed by the British Electrical and Allied Industries Research Association. During the year two of the more important of the Board's researches relating to the use of electricity in coal mines reached a stage at which reports on them could be published, namely, those regarding the pressures produced by electric arcs and by the blowing of electric fuse links in closed vessels. (S.M.R.B. Papers Nos. 38 and 39.—ELECTRICAL REVIEW, April 27th, 1928, p. 740). In the first of these reports, experiments on the formation of electric arcs by the separation of metallic contacts are described, currents up to 1,350 A at 575 V being employed. The records gave no indication of the production of a pressure-pulse at the moment of forming the arc, and no dangerous pressure due to the vaporisation of the metal poles was produced, provided that an adequate circuit breaker was included in the system. Future work on this problem will be on the striking of arcs due to the breakdown of the dielectric across a gap. The pressures produced on blowing electric fuse links have been shown to be entirly attributable to the vaporisation of the metal of the fuse link, and no excessive pressures have been obtained.

I.E.E. Golf Competition.

Valuable prizes, given by electrical firms, were recently competed for at the annual golf competition of the Mersey and North Wales Centre of the Institution of Electrical Engineers, played at Woolton. It was decided to devote the entrance fees to the I.E.E. Benevolent Fund. For the G. P. Dennis trophy, Messrs. P. J. Robinson, J. H. Collie, and W. Kirkham tied. This situation was repeated in the first division by Messrs. J. Mee, W. Kerfoot, and Mr. F. C. Wilson. Mr. A. F. Aaron won the visitors' prize, and in the second division Mr. A. G. Barnard won. Mr. T. S. Boot and Mr. Kerfoot won the two-ball foursomes, and Mr. A. S. Owen the putting competition. The usual dinner in the Clubhouse followed the competition, and Dr. F. J. Teago presided.

Nickel-Iron Alkaline Batteries.

Of late years large numbers of nickel-iron-alkaline batteries have been used for commercial-vehicle lighting, and although one of the main features of these batteries is that they do not require the same attention as lead cells, there are several points which are worthy of attention, and the following notes on the maintenances of such batteries which we have received from Messrs. C. A. Vandervell & Co., Ltd., may prove useful. Practically no lead battery maintenance rules are applicable to the C.A.V.-NIFE cell. If both types of batteries are in use in the same garage particular care must be taken to keep the acid and the alkaline electrolytes apart, as either one is inimical to the type of battery for which it is not intended. This care must even be extended to the use of separate utensils for each type of solution, and on no account must a n.i.a. battery be topped up or its gravity tested with instruments which are in use for lead cells. A characteristic of the nickel-iron-alkaline battery is that the density of the electrolyte remains constant during charge and discharge. In a new battery, either charged or discharged, the gravity of the solution should be 1.190, and once it has been adjusted to this figure it will not normally require any further adjustment in service. Over a period of about 12 months in average service the solution will gradually become stale, and it is then advisable to completely renew it. At the time of annual change of solution it is also recommended to clean and paint the battery crates and cell containers, which can be done very conveniently while the battery is dismantled. Ordinary service evaporation of the solution is made good by topping up with distilled water only. Apparently distilled water for lead cells is frequently slightly acid; such so-called distilled water is totally unsuitable for use in n.i.a. cells, and soon causes trouble. If 'buses are on a service where there is a lot of standing time at night, the batteries may occasionally run down, and in such cases they should be removed from the vehicle for a supplementary charge for 12 hours at the normal charging rate. In service the containers of C.A.V.-NIFE cells swell slightly, but this does not indicate anything wrong with the cells; the clearances between the containers are sufficiently large to allow for this normal swelling. On the other hand, a battery may, by mistake, be stored with solid plugs in the vent holes, and gas pressure under these conditions may give rise to excessive swelling. Cells which have swollen in this way can easily be put right by pressing gently between two pieces of board in a screw vice.

Fatalities.

An inquest was held at Catterick (North Yorkshire) military camp on July 21st regarding the death of Frank Pickering, of Stockton, who received a fatal electric shock on the previous day. Arthur Buttery said that he was on top of the roof of the Royal Tank Corps officers' mess, painting the spouts. Pickering was inspecting that work, and the electric wires were only one foot above the buildings. There were four wires, and Pickering stepped between, and after touching the first set fell on the second set. John William Egglestone said that he asked the mess sergeant to cut off the current. When he got Pickering off the wires they flared. A verdict of "Accidental death" was returned.

Giving evidence at the inquest at South Elmsall recently on Harry Briggs, aged 30, of Burntwood Road, Grimethorpe, who died after receiving an electric shock at Grimethorpe Colliery, Frank Day, chief electrician at the pit, said he instructed Briggs and a man named Leonard Rogerson to clean out the transformer cubicles. He turned off the current to the cubicles, but unfortunately forgot to operate the switch for the winder "feed." Evidently Briggs touched the feed, and received a shock at 22,000 V. The Coroner said that he did not think there was any wilful negligence. The jury returned a verdict of "Death from misadventure."

Appointments Vacant.

Showroom manager (£500) for the Leicester Corporation Electricity Department. Deputy inspector of telegraphs and telephones (£E1,200) for the Egyptian Government. Foreman (telegraph mechanician) (£400) for the Government of Nigeria Posts and Telegraphs Department. Accountant ($400 per month+, dollar=2s. 4d.), for the Government of the Federated Malay States. Junior technical assistant (£85+) for the Admiralty Naval Establishment, Portsmouth. Lady electric cooking demonstrator (£150) for Darlington Corporation. City electrical engineer, for Hull Corporation (salary £1,300, rising by two annual increments to £1,500). (See our advertisement pages to-day.)

Co-operation Between Welding Associations.

The British Acetylene and Welding Association was formed some years ago, but it was felt that its field of operation was rather narrow, and that there was need for an association to deal with electrical and other types of welding. As a result, the Institution of Welding Engineers was formed. It was soon realised, however, that the existence of two organisations with somewhat similar objects was not conducive to the general advancement of the interests of the welding industry, and efforts for amalgamation have been made from time to time Hitherto these efforts have been unavailing, but now the basis of a scheme for co-operation has been arrived at.

The prevailing idea is that, broadly speaking, the Association shall represent manufacturers, and that the Institution shall fulfil the functions of a technical society dealing with welding in all its branches. It is proposed that the name of the Association shall be altered to "The British Acetylene Association" and its membership restricted to firms manufacturing and/or selling acetylene, acetylene apparatus, carbide of calcium and oxygen, and employés nominated by such firms. The proposals with regard to the Institution are that it is to confine its activities to promoting the extension of the use of welding in all its branches and to the advancement of the science of welding in all its forms; its membership is to be confined to individuals.

Royal Sanitary Institute Congress.

At the Congress of the Royal Sanitary Institute, held at Plymouth last week, Col. W. A. Vignoles read a paper before the engineering section on "Electrical Refrigeration."

In connection with the Health Exhibition, which was one of the features of the Congress, the chairman of the judges announced that the blue riband of the sanitary engineering profession had been awarded to one of the stallholders. This award, the Rogers Field Medal, had been in existence for many years, but it had only been given on one or two special occasions when the exhibit was of pre-eminent merit. It was now awarded to the Artofex Engineering Works, Ltd., for its exhibit of a complete electrically-equipped working bakery in operation. A silver medal was awarded to the Plymouth Corporation Electricity Department. The Department, in conjunction with local contractors and others, showed the application of electricity for all purposes in the home, shop and factory. During the Congress the Department opened temporary showrooms, wherein a display of a similar character was made. Silver medals were also awarded to Messrs. Hoover, Ltd., Vampires, Ltd., and the British Hanovia Quartz Lamp Co., Ltd.

Holophane Conference.

A conference of municipal electrical engineers was held at the headquarters of Holophane, Ltd., on July 17th, when there was a good attendance, and much interest was shown in the various papers which were read by members of the Holophane staff and the latest Holophane developments in street lighting, colour lighting, and the manufacture of high-grade illuminating glassware. In the evening the company

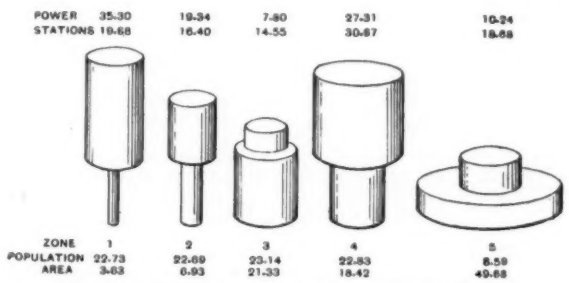
assembled at dinner at the Criterion Restaurant, under the chairmanship of Lord Ernest Hamilton, chairman of directors of Holophane, Ltd. The subsequent proceedings were enlivened by professional artistes, and an instructive and informative day finished on a high note of cordiality and friendship.

The American Radio Industry.

The rapid progress of radio apparatus design and development makes many persons fear that the sets they purchase to-day will be superseded by something better and possibly cheaper to-morrow. In order to overcome this difficulty American manufacturers of radio equipment are now engaged in the task of fixing standards for "trade-in" values of sets, intended to make radio buyers as confident of disposing of their sets as motor-car purchasers are confident of disposing of their cars when they are ready to buy new models. At the June meeting at Chicago of the Radio Division of the National Electrical Manufacturers' Association, Mr. Louis B. F. Rayscroft, vice-president of the organisation, announced that within the next few months a handbook on "trade-in" values would be placed in the hands of each of the 30,000 retail radio dealers in the United States.—*Reuter's Trade Service* (Chicago).

In an address on "Radio's Relation to Electric Light and Power," delivered before the National Electric Light Association in Atlantic City, U.S.A., recently, Mr. H. P. Davis, vice-president of the Westinghouse Electric & Manufacturing Company and chairman of the board of directors of the National Broadcasting Company, stated that the radio industry gave employment to 320,000 people. The sales value of radio merchandise in 1927 was approximately 500 million dollars; in seven years a business worth two billion dollars had been created. About 10,000,000 of the 28,000,000 homes in the United States were equipped with receiving sets, there were 694 broadcasting stations, and about 40,000,000 broadcast listeners in the United States. Radio, he said, was 100 per cent. electric power consuming, and, as such, was of great importance to power companies. It had changed the habits of people to the extent that their average retiring hour had become later, both in cities and the country, which had resulted in a greatly increased use of electric light; thus radio had been the means of greatly increasing the consumption of electricity. Now that radio had grown into such a business giant, without perhaps any too much nurturing on the part of the electrical industry, was it not time that they unreservedly acknowledged this offspring, and undertook its development from every point of view? If radio had grown in so short a period in such an exotic way, with so little care and cultivation from its parent industry, what immense possibilities were attainable if the electrical industry as a whole would so acknowledge it.

In order to show in a graphic way the exact comparisons by radio zones of broadcasting facilities proportionate to the population, area, power and number of licences, the accompanying chart has been prepared by the Radio Division of the American National Electrical Manufacturers' Association. It is the work of Mr. Ralph H. Langley, of the Crosley Radio Corporation and chairman of the N.E.M.A. committee on



Graphic Comparison of American Radio Zones.

section activities. The bottoms of the cylinders represent the area and the population of the five zones created by the Radio Act of 1927; their diameter is proportional to the area of the zones, while their height is proportional to the population. The first four zones are closely alike in population, but the fifth zone is much lower than any of the other four. The areas of the zones differ greatly; for instance, the fifth zone is *thirteen* times the area of the first zone. The upper cylinders indicate the number and total power of the broadcasting stations assigned to each zone; the diameter is representative of the number of stations and the height of the total power.

Madras Hydro-Electric Projects.

An Indian correspondent informs us that, with a view to meeting public criticisms, the Government of Madras recently ordered a detailed re-examination of the chief hydro-electric projects which it has undertaken in the Presidency. As a result of this review, the chief engineer submitted to the Government detailed reports on the Pykara project, including a study from the financial point of view. The main development differs very little from that indicated in the report; the estimates are somewhat lower, and the ultimate return on invested capital is more favourable. Three schemes have been submitted. The first two assume the electrification of a certain section of the South Indian Railway over varying periods and the transmission of power to Madura, Trichinopoly, Dindigul, and, in addition, to Coimbatore and the Nilgiris; the third assumes the transmission of power to Coimbatore and the Nilgiris. None of the schemes includes Madras, though, after a few years it will be possible to extend the scheme to that city. If the hydro-electric scheme is to be undertaken on a sound commercial basis, the revenue derived from the proposed railway load is absolutely necessary to help to cover operation and maintenance expenses. Without the railway load, development must be along modest lines. The South Indian Railway is in favour of a restricted electrified programme, and the Railway Board has referred the programme to its engineers, whose report is awaited. The extent of initial hydro-electric development in the areas referred to depends mainly upon the recommendations in the report to the Railway Board, and until these are received it is not possible to decide which of the three schemes is to be developed.

The preliminary survey, investigation, &c., have been so far undertaken at Pykara, but the Government contemplates the immediate construction of certain preparatory works common to all the schemes. Once construction is initiated it will be possible in about a year to give light and power service to the Nilgiris from the auxiliary plant. The Government is studying the possibility of introducing regulations for the distribution and sale of electrical energy.

Regarding the Papanasam project, it is proposed to obtain a guarantee of a fixed block of power, so that a certain revenue will be available, while the potential and promising power market around Tinnevelly, Tuticorin, and the neighbouring districts is being developed. Negotiations are in progress with certain industrial interests. It is the intention of the Government to prepare plans for comprehensive electric power generation and a transmission system embracing the whole of the Presidency, which will gradually be developed as funds become available.

Marconi Patents Application.

Before the Comptroller-General of Patents on Tuesday last, the Brownie Wireless Co. (of Great Britain), Ltd., applied for a compulsory licence under certain Marconi patents and they also pleaded for a reduction of the royalties payable to the Marconi Co. Mr. Moritz, K.C., who appeared for the applicants, said that the existing royalty of 12s. 6d. per valve-holder was "strangling the trade." He suggested that if the present basis was retained the royalty should not be more than 5s. for the first valve and 2s. 6d. for each succeeding valve. A better method of charging the royalty would, however, be a levy of, say, 5 per cent. of the retail selling price of the set. The hearing was being continued at the time of our going to press.

Royal Commission on Transport.

The members of the Royal Commission on Transport were announced on July 24th in the House of Commons by the Minister of Transport. The chairman is Sir Arthur Griffith-Boscawen, and other members are: Marquis of Northampton, Major Sir Isidore Salmon, Major Crawfurd, Sir Matthew Wallace, Mr. W. R. Smith, Major Astor, Earl of Clarendon, Sir William Lobjoit, Sir E. Varvill Hiley, Mr. J. Learmonth, Mr. F. Montague. The terms of reference are as follows:—"To take into consideration the problems arising out of the growth of road traffic, and, with a view to securing the employment of the available means of transport in Great Britain (including transport by sea, coastwise and by ferries) to the greatest public advantage, to consider and report what measures, if any, should be adopted for their better regulation and control, and, so far as is desirable in the public interest, to promote their co-ordinated working and development."

An Austrian Congress.

The thirtieth annual congress of the Union of Austrian Electric Lighting Undertakings has just been held in Vienna; among the papers read were one on "The Construction of High-Pressure Steam Power Stations, with special reference to the Benson Boiler," by Dr. Ing. Gleichmann, of Berlin, and one on "The Technical and Economic Development of High-Pressure Cables," by Prof. Dr. Petersen, of Berlin. During the week the members had an opportunity of visiting a number of works in the Vienna district, including those of the Austrian Siemens Schuckert Co.; the A.E.G. Union Elektrizitats Co., and the Kremenezky Electric Lamp Works.

E.A.W. Activities.

We have received a copy of a letter which the Electrical Association for Women is sending out to a number of electrical manufacturing companies, asking for support of a scheme for the training of girls in household science and cookery. The suggestion is that the firms should take on one or more of the girls who have had training under the scheme with a view to giving them showroom experience, and eventually to retain them on their own staffs if openings exist, or to send them on to the various electricity supply undertakings which are increasingly applying for skilled demonstrators.

Association of Supervising Electrical Engineers.

The programme of lectures for the 1928-9 session of the above Association includes the following fixtures:—October 2nd, presidential address and distribution of prizes; Novem-

ber 6th, "Law of Patents," by A. Peter Thurston, D.Sc.; December 4th, "Some Aspects of the Electricity Act, 1926," by W. S. Kennedy, LL.B.; January 1st, "Power Factor Correction," by C. S. Buyers, M.I.E.E.; February 5th, "Beam Wireless," by Lt.-Col. A. G. Lee, O.B.E., M.I.E.E.; March 5th, "Modern Electric Signs," by G. P. Garbett; and April 2nd, "Variable Speed A.C. Commutator Motors," by C. V. Hill, B.Eng. The lectures will be held at the Junior Institution of Engineers, 39, Victoria Street, S.W., at 7.15 p.m.

Talking Kinema Films.

A lecture on the above-named subject, accompanied by a demonstration, was delivered recently by Mr. C. F. Elwell, technical adviser to the British Phonofilms Company, Limited, at the International Photographic Congress held at the Imperial Institute in London. In describing the results of research work already carried out, Mr. Elwell said that a gramophone, capable of playing continuously for 11 hours, with the use of only 1,000 ft. of film, and a machine for the reading of novels to the blind, had already been developed and would probably be placed on the market shortly. The recording of sound for, and reproduction by, these machines were carried out on the same principle as that employed for talking films, the making of which on the De Forest system was explained by the lecturer. According to *The Times* Mr. Elwell said that experiments were now being carried out on 16-millimetre films, and it was possible that small kinema projectors for talking films would be obtainable for the home before long. After long research work it had been made possible for the strip of recorded sound on films to be reduced to 1 millimetre in width. This would enable, in the case of a gramophone using film records, a very long record to be made on a very short piece of film. The film on which the reading of a novel could be recorded would be comparatively small and, when compared with the present bulky books which were being constructed for the blind, would be inexpensive. The long-playing gramophone would prove popular, he said, as a substitute for dance orchestras and orchestras at small kinemas. In addition, it would prove more popular than the ordinary gramophone, on account of its superior qualities of reproduction. The demonstration of several short talking films made by British Phonofilms, Limited, was in nearly every case successful.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Grand Council of the Federation of British Industries has co-opted Mr. E. GARCKE.

Mr. W. C. GALLOWAY, chief clerk to the Birkenhead Electricity Department, who is retiring, was presented by his colleagues on July 13th with a gentleman's wardrobe. The presentation was made by the borough electrical engineer, Mr. F. E. Spencer.

Mr. ROWLAND, chief assistant at the Peterborough Corporation electricity works, has received a presentation from the staff on the occasion of his silver wedding.

Mr. GEORGE J. RACKHAM has been appointed chief engineer of the Associated Equipment Co., Ltd., as from August 1st, 1928, and will be responsible for the Designing, Experimental and Research Departments.

Mr. JAMES B. SHIELD, on resigning his position as works manager to Messrs. Anderson, Boyes & Co., Ltd., Motherwell, has been presented by the staff and employés with a cut crystal lamp, together with a silver rose bowl for his wife.

St. Pancras Parliamentary and General Purposes Committee recommends that the title of Mr. T. W. MERRY, station superintendent, be altered to resident station engineer, and that his salary be increased to £650 per annum (not subject to revision in regard to cost of living), and that he be allowed the use of Clifton Lodge, rent and rates free, with coals, light, &c., also that the salary of Mr. J. H. BRYAN, canvasser and consumers' adviser, be increased from £385 to £450 per annum inclusive.

Mr. JAMES J. COOK, assistant to the commercial engineer of the Birmingham Electricity Department, has been appointed hiring and sales superintendent by the Darlington Corporation, in connection with new electricity showrooms which are to be opened in Skinnergate, Darlington. The salary is £250 per year and five per cent. commission.

Mr. J. C. THOMPSON, assistant electrical engineer at Sheerness Dockyard, who is leaving to take up a position at Malta Dockyard, has been presented by the employés of the Electrical Engineering Department with a portable gramophone. Mr. Thompson is succeeded at Sheerness by Mr. R. BAILLIE.

Alderman D. B. FOSTER, an electrical worker and the chairman of the Leeds Corporation Electricity Committee, is to be the next Lord Mayor of Leeds, as nominee of the Labour Party.

Mr. R. W. DALTON, the Senior Trade Commissioner in Australia, arrived back in the Commonwealth last month after an official visit to this country extending over a period of twelve months. Mr. Dalton stated that he was much impressed by the evident desire of people at home to buy Empire products. The work of the Empire Marketing Board had been of outstanding benefit.

Mr. F. J. E. BRAKE, sales manager, has been appointed a director of Standard Telephones and Cables, Ltd.

Obituary.—MR. L. J. DIX.—The death has taken place from injuries received whilst motor-cycling of Mr. Leslie J. Dix, electrical engineer, a member of the staff of the Crowborough District Electricity & Gas Co.

MR. P. V. VERNON.—We regret to learn that Mr. P. V. Vernon, O.B.E., director and chief designer of Messrs. Alfred Herbert, Ltd., passed away on July 22nd, after a short illness, at his residence, Keresley Manor, near Coventry. He had been with the company for 31 years, and was appointed a director in 1911.

Wills.—The late Mr. T. R. RAYMOND, formerly secretary to Messrs. Stothert & Pitt, Ltd., left £15,960 (£15,861 net personalty).

The late Sir ALEXANDER RICHARDSON, who was editor of *Engineering* and formerly member of Parliament for Gravesend, left £14,828.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Electramonic (Foreign Rights), Ltd.—Public company. Registered July 17th. Capital, £100,000 in 5s. shares. Objects: To acquire an exclusive licence for the whole world, except the British Isles, to use, exploit and develop all inventions owned by the Electramonic Co., Ltd., to carry on the business of importers, exporters, manufacturers and factors of, agents for and dealers in gramophone records, gramophones, television apparatus, electrical and wireless apparatus, &c., and to adopt an agreement with the Walden Syndicate, Ltd. The directors are:—Sir Philip Dawson, M.P., M.Inst.C.E., Maybourne, Sydenham, S.E.26, chairman (chairman of Electramonic Co., Ltd., and director of Johnson & Phillips, Ltd.); E. B. Tredwen, 9, Bishopsgate, E.C.2; Dr. D. Jochelman, 23, Shepherd's Hill, N.6 (and Paris), merchant banker; W. H. Sayers, B.Sc., Chesham House, Regent Street, W. (managing director of Electramonic Co., Ltd.). The Electramonic Co., Ltd., may, while holding by itself or its nominees 40,000 shares, appoint two directors, one of whom shall be chairman. Registered office: 1, Budge Row, E.C.

Auto Electric Devices, Ltd.—Public company. Registered July 14th. Capital, £50,000 in 1s. shares. Objects:—To carry on the business of manufacturers, repairers, importers and exporters of, and dealers in, gramophone motors, gramophones, records, amplifiers, loud-speakers, pianos and organs; dynamos, generators, accumulators, batteries, &c., and to adopt an agreement with the J. & C. Manufacturing Co., Ltd., and N. G. Johnson. The subscribers (each with one share) are:—E. J. Burrows, 29, Lyndhurst Road, Higham's

Park, E.4, solicitor's clerk; J. Barnes, 7, Walcot Gardens, Kennington, S.E.11, accountant; and five others. The first directors are to be appointed by the subscribers. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.

British Electrical Reproduction Co., Ltd.—Private company. Registered July 17th. Capital, £600 in 253 ordinary shares and 347 8 per cent. cumulative participating preference shares of £1 each. Objects: To acquire from A. B. Calkin and C. Berrage-Moulton certain patent rights, electrical reproducers, and miscellaneous stock, and to carry on the business of manufacturers of and dealers in electrical and other reproducers of sound, gramophones, &c. The directors are:—G. E. Myers, 88, Kingsway, W.C.2, secretary to public company; A. B. Calkin, 21, West Heath Avenue, N.W.11; C. Berrage-Moulton, 12, Buckland Crescent, Swiss Cottage, N.W.8, engineer. Solicitor: F. P. Woodcock, 5, Holborn, E.C.1.

Dayson, Ltd.—Private company.—Registered July 6th. Capital, £1,000 in 990 8 per cent. cumulative preference shares of £1 each and 200 ordinary shares of 1s. each. To carry on the business of manufacturers of, and dealers in, wireless apparatus of all kinds, wireless, electrical and mechanical engineers, toolmakers, brassfounders, metal workers, &c. The first directors are:—H. L. K. Johnson, 23, Hillside Drive, Edgware, Middlesex, engineer; J. S. Jewell (chairman), 37, Portsdown Road, Maida Vale, W., merchant. Solicitors: Wild, Collins & Crosse, Kennan's House, Crown Court, Cheapside, E.C.2.

Climax Electric Co., Ltd.—Private company. Registered July 21st. Capital, £10,000 in £1 shares (5,000 8 per cent. cumulative preference and 5,000 ordinary). Objects: To acquire from R. Lomax the benefit of certain existing inventions relating to the production of electric service boxes, &c. The subscribers (each with one share) are: J. R. Garner, 31, Clyde Road, West Didsbury, Manchester, and P. C. Walker, 6, Malpas Drive, Timperley, Ches., engineers. P. C. Walker signs documents as director. Qualification: £100 shares. Solicitors: J. Arnold Brierley & Robinson, Priory Buildings, Union Street, Oldham.

National Lighting Co., Ltd.—Private company. Registered July 21st. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with E. A. Moses and to carry on the business of suppliers and manufacturers of electrical fittings and appliances, wholesale and retail, importers and exporters carried on by him in London and elsewhere. The subscribers (each with one share) are: D. S. Woolf, Liverpool House, 15-17, Eldon Street, E.C., clerk; W. Heiber, Wyndham House, Shoot-Up-Hill, Brondesbury, N.W., merchant. E. A. Moses is permanent managing director and chairman. Registered office: 36, Farringdon Street, E.C.4.

Martindale Electric Co., Ltd.—Private company. Registered July 19th. Capital, £200 in £1 shares. Objects: To carry on the business of manufacturers of or dealers in electric motors, maintenance accessories, &c. The subscribers (each with one share) are:—E. H. Martindale, Elmwood, North End Road, Hampstead, N.W.3; and H. L. K. Johnson, 23, Hillside Drive, Edgware, Middlesex, electrical engineers. The first directors are to be appointed by the subscribers. Solicitor: L. F. Crane, Bush House, Aldwych, W.C.2.

Taylor, Whiting & Taylor, Ltd.—Private company. Registered July 16th. Capital, £4,000 in £1 shares. To acquire the business of electricians carried on by P. Whiting and D. Taylor at Oakes Yard, St. Peter's Street, Derby. The permanent directors are:—P. Whiting, 77, Kedleston Road, Derby; and D. Taylor, 13, Bank View Road, Derwent Bank, Derby, art metal workers and electricians. Secretary: P. Whiting. Registered office: Oakes Yard, St. Peter's Street, Derby.

"S.X." Coil Winding Co., Ltd.—Private company. Registered July 13th. Capital, £500 in £1 shares. Objects:—To acquire the business of electrical and wireless repairers carried on by L. J. Davis at Leigh-on-Sea. The directors are:—L. J. Davis, 20, Herschell Road, Leigh-on-Sea; G. C. V. Deverell, "Fair Oak," London Road, Leigh-on-Sea. Registered office: R.H.P. Garage, Fleming Avenue, London Road, Leigh-on-Sea.

Elektra Porcelain Co., Ltd.—Private company. Registered July 14th. Capital, £3,500 in £1 shares. Objects:—To acquire the business of an electrical porcelain, china and earthenware manufacturer now carried on by W. T. Baxter at Edensor Works, Edensor Road, Longton, Staffs., as the "Elektra Porcelain Co." The permanent directors are:—W. T. Baxter, Blythe Bridge, Staffs.; and C. L. Baxter, "Glengarry," Blythe Bridge, Staffs., earthenware and porcelain manufacturers. Secretary: C. L. Baxter.

Buswell & Sweeney, Ltd.—Private company. Registered July 19th. Capital, £2,000 in £1 shares. Objects: To carry on the business of mechanical, electrical and general engineers, &c. The directors are:—E. Buswell, 280, Mansel Road, Small Heath, Birmingham; and J. G. Sweeney, 19, Croft Road, Yardley, Birmingham, engineers. Secretary: H. Cavenagh. Registered office: 55, Newhall Street, Birmingham.

Spaven Bros., Ltd.—Private company. Registered July 20th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, electricians, mechanical engineers, &c. The directors are:—R. C. Spaven, 10, Nevile Avenue, Dudley Hill, Bradford; C. James, 13, Ingledew Crescent, Roundhay, Leeds. Registered office: 9, Forster Square, Bradford.

Ultraphone Syndicate, Ltd.—Private company. Registered July 9th. Capital, £100 in £1 shares. Objects:—To carry on the business of manufacturers of, and dealers in, gramophones, talking machines, films, talking films, wireless, and all kinds of automatic, telephony, musical instruments, photography, &c. The directors are:—W. A. Hunter, 115, Cromwell Road, South Kensington, S.W.7, merchant; L. A. Hart, 38, Fitzjohn's Avenue, Hampstead, N.W.3, solicitor. Qualification: £1. Remuneration as fixed by the company. Solicitors and registered office: L. A. Hart and Co., 13, Albemarle Street, W.1.

Official Returns of Electrical Companies.

Electrical Finance and Securities Co., Ltd.—Supplemental trust deed dated July 6th, 1928, to secure £96,800 further debenture stock (supplemental to trust deed dated July 29th, 1927). Property charged: The company's undertaking and assets, including uncalled capital. Trustees for debenture stock holders: Second Consolidated Trust, Ltd., Dashwood House, Old Broad Street, E.C.

Madras Electric Tramways (1904), Ltd. — Capital, £200,000 in 125,000 preference and 75,000 ordinary shares of £1 each. Return dated May 16th, 1928. 100,000 preference and 75,000 ordinary shares taken up. £85,240 paid on 67,500 preference and 17,740 ordinary shares. £89,760 considered as paid on 32,500 preference and 57,260 ordinary shares. Mortgages and charges £130,000.

Greenwich Cable Works, Ltd.—Trust deed dated July 5th, 1928, to secure £65,000 debenture stock and premium of 2 per cent., charged on freehold property at Greenwich and Beddington and the company's undertaking and property, present and future, including uncalled capital. Trustees: Beaver Trust, Ltd., 1, Queen Victoria Street, E.C.

Chelsea Electricity Supply Co., Ltd.—Capital, £450,000 in 30,000 preference and 420,000 ordinary shares of £1 each. Return dated May 3rd, 1928. 395,488 ordinary and 30,000 preference shares taken up. £218,850 paid on 30,000 preference and 188,850 ordinary shares. £206,638 considered as paid on 206,638 ordinary shares. Mortgages and charges, £72,380.

Midland Electric Lamp Co., Ltd.—H. Harris, c/o E. G. Chesworth & Son, 17, Brazennose Street, Manchester, was appointed receiver on June 28th, 1928, under powers contained in debentures dated March 31st, 1926.

Carlisle and District Transport Co., Ltd.—Capital, £60,000 in £1 shares. Return dated May 25th, 1928. 60,000 shares taken up. £60,000 paid. Mortgages and charges: £40,000.

Glantawe Electric Supply Co., Ltd.—Debenture dated July 7th, 1928, to secure £1,000, charged on leasehold land and premises at Ystradgynlais and the company's undertaking and other property, including uncalled capital. Holder: T. J. Davies, Maesyderi, Abercrave, Brecon.

General Cable Manufacturing Co., Ltd.—Particulars filed of £41,400 debentures authorised June 29th, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Satisfaction in full on June 30th, 1928, of debenture dated March 18th, 1927, securing £11,000.

Satisfaction to the extent of £20,000 on June 30th, 1928, of debentures dated March 18th, 1927, securing £60,000.

Brompton and Kensington Electricity Supply Co., Ltd.—Capital, £400,000 in £1 shares. Return dated May 3rd, 1928. 358,466 shares taken up. £199,845 paid. £158,621 considered as paid. Mortgages and charges nil.

Yeovil Electric Light and Power Co., Ltd.—Capital, £50,000 in £1 shares. Return dated May 28th, 1928. All shares taken up. £50,000 paid. Mortgages and charges nil.

Eastern Wireless Co., Ltd.—Capital, £500 in £1 shares. Return dated October 29th, 1927 (filed April 16th, 1928). All shares taken up. £500 paid. Mortgages and charges nil.

Sheffield Electric Power Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1927 (filed May 24th, 1928). Two shares taken up. £2 paid. Mortgages and charges nil.

Electrical Contracts and Maintenance Co. (1925), Ltd.—Capital, £3,000 in £1 shares. Return dated April 17th, 1928. 2,305 shares taken up. £2,305 paid. Mortgages and charges £250.

Coley & Swinnerton, Ltd.—Capital, £2,000 in £1 shares. Return dated June 19th, 1928. 1,001 shares taken up. £1,001 paid. Mortgages and charges nil.

John Adams, Ltd.—Capital, £7,000 in £1 shares (6,000 preference and 1,000 ordinary). Return dated May 4th, 1928. 2,500 preference and 300 ordinary shares taken up. £2,800 paid. Mortgages and charges nil.

Durham and District Electric Traction Co., Ltd.—Capital, £30,000 in £1 shares. Return dated November 9th, 1927 (filed January 27th, 1928). Seven shares taken up. £7 paid. Mortgages and charges nil.

Central Electric Supply Co., Ltd.—Capital, £350,000 in £5 shares. Return dated February 29th, 1928. 65,000 shares taken up. £100,000 paid, £225,000 considered as paid. Mortgages and charges: £487,056.

Herrick, Durrell & Co., Ltd.—C. A. Dodds, 3, Copthall Buildings, E.C., ceased to act as receiver or manager on November 22nd, 1927. (Notice filed July 5th, 1928.)

P. N. Forbes, Ltd.—Debenture dated June 15th, 1928, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. A. Longley, 4, Draycott Place, S.W.1.

Portable Wireless, Ltd.—Satisfaction in full on June 27th, 1928, of debenture dated December 12th, 1927, securing £100.

Shoreham and District Electric Lighting and Power Co., Ltd.—Issue on June 30th, 1928, of £600 8 per cent. second debentures, part of a series already registered.

City Notes.

Telephone Manufacturing Co., Ltd.

This company's report for 1927 was reviewed in our last issue (p. 117). The annual meeting was held on July 19th, when the chairman (Mr. F. T. Jackson) said that the installation side of the business had made good progress in spite of considerable competition, and a further advance had been made during the first half of the current year. The capital of the Australian company had been increased; it was the intention to dispose of the preference shares to Australian investors, while maintaining control through the ordinary capital. The business in Australia was proceeding satisfactorily, and they anticipated that eventually the company would be of great benefit to the parent company. In view of the stabilisation of the currency, they had taken in hand the reorganisation of the Paris and Brussels companies. That would not affect the accounts, for they had built up a substantial reserve out of past profits. The share capital had been written out of the company's books, except a comparatively small amount, and it might be necessary, in the case of the Paris company, at any rate, to introduce a small amount of further capital. The business of both companies was proceeding favourably. Although there were possibilities of good business in certain Spanish towns, they were confining their activities to the Madrid company with its branch at Barcelona. Returning to the affairs of the home companies, Mr. Jackson said that competition which had arisen from the importation of foreign automatic exchanges was being successfully combated. The policy of the Government in not granting some form of protection for all manufactured goods was a very shortsighted one. If protection was granted to the very large number of small manufacturing industries in this country the majority of the unemployed could be absorbed. During slack times they found it necessary to keep on more of their highly-trained staff than was economically justifiable, and for that reason it paid them to take contracts at cut prices rather than have no work. The position had improved considerably this year, but prices were still exceedingly low. They had, however, cut their costs down to a very low figure, which would be of great advantage when the senseless competition ceased. The directors were constantly considering the manufacture of new lines to spread the production over a wider field; by this means depression in one branch did not affect the whole of the company's business. It was the board's policy to build up the business to a position of great financial strength, instead of paying dividends at present. That would result in capital appreciation even if the returns were comparatively small for some time to come. In conclusion, the chairman referred to the institution of an employés' life insurance and pensions scheme and to the retirement of Mr. C. E. Walker from the board. He said that Lieut.-Gen. Sir Walter Campbell had been appointed to fill the vacancy.

Burndept Wireless, Ltd.

In our last issue (p. 116) we gave particulars of a scheme for the formation of a new company to take over the assets of the existing company. It is now stated that an agreement has been made for the underwriting of the whole of the proposed issue of 600,014 ordinary shares provided the scheme becomes operative. The largest shareholder (Capt. Horridge) has expressed his approval of the proposals and has consented to join the board of the new company. If the scheme is not adopted and liquidation becomes inevitable, there is no prospect of the shareholders receiving anything.

Details of the reconstruction have now been published. The proposed new company will have a capital of £200,000 in 800,000 5s. ordinary shares, of which the holders of the present preferred and deferred ordinary shares will be entitled to 600,014 in the following proportions:—Preferred: Two new shares for each old share; deferred: One new share for each twenty. The shares will be credited with 1s. 9d. paid, leaving 3s. 3d. to be provided by the holders. The new company will issue about £20,300 of 6 per cent. 10-year notes which will be allotted to creditors for £10 or over at the rate of 50 per cent. of the amounts due to them.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Atlas Light and Power Co., Ltd.—114,789 new ordinary shares of £1 each, fully paid, Nos. 2,635,212 to 2,750,000. (Ranking for dividend from April 1st, 1928.)

Postal Telegraph and Cable Corporation.—£35,136 5 per cent. collateral trust debenture stock and fractional scrip certificates. $332,829 5 per cent. collateral trust gold bonds and fractional scrip certificates.

Application has been made to the Committee to allow the following to be officially quoted:—

American Telephone and Telegraph Co.—$3,745,000 capital stock.

Bournemouth and Poole Electricity Co., Ltd.—360,000 ordinary shares of £1 each, fully paid, Nos. 800,001 to 1,160,000.

Brazilian Traction, Light and Power Co.

The *Financial Times* states that at last week's annual meeting, Mr. Miller Lash (vice-president) said that about 55 per cent. of the company's stock was held in Canada, 15 per cent. in England, 25 per cent. on the Continent, and virtually none in the United States. The June earnings constituted a record, amounting to $3,631,329. The gross earnings for the first half of the current year showed an increase of $2,118,000, and the net earnings at $11,895,000 were $1,285,649 higher. The depression in Brazil continued, but some industrial improvement was evident, except in the textile industry. The third 40,000-h.p. set ordered would be in operation at the end of 1929.

Auto Electric Devices, Ltd.

Particulars of the registration of this company are given in the "New Companies" section of this issue. Last week the company issued, for information only, a statement of its capital, objects, &c. It was stated that the issued capital consists of 700,000 1s. shares, of which 580,000 have been issued for cash and 120,000 as purchase consideration to the vendors or their nominees. The company is to take over and develop an automatic self-winding electric motor for use in gramophones for which patents have been applied for. The manufacture of small electric motors for gramophone and other uses will also be undertaken at a factory in Brighton.

British Phototone, Ltd.

This company was recently formed, with a nominal capital of £250,000 in 1,000,000 5s. ordinary shares, to develop a system of combining sounds with film pictures for kinema and home use. It is proposed to sell "Phototone" equipments under a maintenance service arrangement. For the purpose of this service the whole of the capital of the Euston Ignition Co., Ltd., has been acquired; the managing director of this company (Mr. F. G. Kirby) has been appointed to the board of the new company. Another director of the latter is Mr. W. H. Lynas, formerly managing director of Graham Amplion, Ltd. An issue of 400,000 shares was made last week and immediately taken up.

Edmundson's Electricity Corporation, Ltd.

The accounts for the year ended March 31st last show a net profit of £125,083 (against £99,715 in the preceding year). The ordinary dividend is maintained at 10 per cent. and £40,000 (against £25,000) is placed to reserve, leaving £39,388 to be carried forward.

The report states that Messrs. P. D. Tuckett, S. Beeton and A. A. C. Swinton have retired from the board, being succeeded by Messrs. F. M. Rogers, A. Winterbottom, and A. N. Rye. Mr. Rogers has been appointed chairman and Mr. Rye managing director. Meeting: August 2nd.

Parkinson and W. B. Cowan, Ltd.

The directors report a net profit of £80,362 for the year ended March 31st last, as compared with £77,717 in 1925-26. A balance of £26,627 is brought forward, making £106,989. The ordinary shares are to receive a final dividend of 7½ per cent., maintaining the rate at 10 per cent., £17,500 is transferred to reserve, and £27,176 carried forward.

Welsbach Light Co., Ltd.

The net profit of this company for the year ended March 31st last was £2,072, against £6,620 in 1926-27. The dividend is reduced from 5 to 2½ per cent., requiring a small transfer from the reserve.

Thomas Bolton & Sons, Ltd.

The final dividend is 2½ per cent., making 5 per cent. for the year, against 2½ per cent. for the preceding year.

Ward & Goldstone, Ltd.

The report for the year ended March 31st last shows a profit, after providing for all expenses and income tax, of £13,901, against £17,086 for 1926-27. To this is added £25,865 brought forward, making £39,766. Interim dividends have been paid, and it is proposed to distribute 4 per cent. on the ordinary shares, making 11 per cent. for the year, and 1 per cent. (participating) on the preference shares, making 8 per cent. for the year. The same rates were paid for the preceding year. A balance of £29,805 is carried forward. Further extensions to plant and machinery are in hand, and should be in operation by the end of the year.

Cable Companies' Purchase.

The Eastern Group of cable companies has purchased the Direct West India Cable Co., Ltd., thereby acquiring the control of that company and its subsidiaries—the Halifax and Bermudas Cable Co., Ltd., the Cuba Submarine Telegraph Co., Ltd., and the West India and Panama Telegraph Co., Ltd. The combined system of the acquired companies comprises 8,000 miles of cables, 22 cable stations throughout the West Indies, and radio stations at Bermudas and Jamaica.

Tottenham District Light, Heat and Power Co., Ltd.

The dividends for the half-year have been declared on the 5 and 5½ per cent. preference stocks; the "A" stock is to receive a dividend at the rate of 8 per cent. per annum, and the "B" stock one at the rate of 6½ per cent. per annum (as compared with 7½ per cent. and 6½ per cent. per annum, respectively).

Electramonic (Foreign Rights), Ltd.

Particulars of this company's registration appear in the "New Companies" section of this issue. On Tuesday last the company made a public issue of 240,000 ordinary shares of 5s. each at par.

W. & T. Avery, Ltd.

The profit for the year ended March 31st last was £99,524, to which is added £52,451 brought forward, making £151,975. Of this, £10,000 is put to reserve (against £15,000), the ordinary dividend is again 15 per cent., and £53,987 is carried forward. The new shares receive 10 per cent.

Thomas De La Rue, Ltd.

There was a net profit of £18,766 for the year ended March 31st last as compared with £8,110 in the preceding year. No dividend is being paid.

Electrical Finance and Securities Co., Ltd.

An interim dividend of 4 per cent. (against 5 per cent.) has been declared on the ordinary shares.

Herbert Morris, Ltd.

The dividends for the half-year to July 31st have been declared on the 6 per cent. and 5 per cent. cumulative preference shares.

W. H. Dorman & Co., Ltd.

The report for the year ended March 31st, 1928, shows a net profit of £10,281, which is deducted from the debit balance of £69,664 from the last account, leaving an adverse balance of £59,383 to be carried forward.

Howard & Bullough, Ltd.

The usual quarterly dividend of 6d. per share is announced.

Torquay Tramways Co., Ltd.

The company has again declared an interim dividend of 4 per cent., free of tax, on its ordinary shares.

Brompton and Kensington Electricity Supply Co., Ltd.

An interim ordinary dividend of 10d. per share is announced, as in 1927.

Chelsea Electricity Supply Co., Ltd.

An interim dividend of 10d. per share has been declared on the ordinary shares, as in 1927.

London Electric Supply Corporation, Ltd.

An interim dividend at the rate of 8 per cent. per annum for the six months ended June 30th, 1928 (9.6d. per share) has been declared on the ordinary shares.

Mather & Platt, Ltd.

An interim dividend of 5 per cent., free of tax, has been declared, as in 1927.

French Company.

The *Compagnie Générale d'Entreprises Electriques* reports a net profit of 1,628,000 fr. for 1927-28, as compared with 1,087,000 fr. in the previous year. It is proposed to maintain the dividend at the rate of 12 per cent. upon the increased capital.

Stocks and Shares.

MONDAY EVENING.

Money Matters.

WHATEVER slight apprehension may have been aroused by the raising of the Bank Rates in New York, Boston and Chicago, it can be said that the money position in this country is now regarded with no feeling of uneasiness. It is true that the hopes of a reduction in our Bank Rate have been quietly shelved. It is also true that the prospect for the remaining five months of the year is suggestive of a 5 per cent., rather than a 4 per cent., Bank Rate. But the present 4½ per cent. minimum is likely to prove effective for its purposes until, at least, the holiday season has passed, and therefore the course of investment prices can be expected to suffer no disturbance yet awhile. That this conclusion is generally accepted is manifest in the strength shown by investment stocks and shares, it becomes vocal in the complaint, heard daily in the Stock Exchange, that the investor's inquiries for sound securities, obtainable at attractive prices, are extremely difficult to satisfy.

T.F.A. Stocks.

The 4½ per cent. debenture stocks of the Tube Railways' stocks issued under British Government guarantee by the Central London, City and South London, and the London Electric Railways are all officially quoted at 95 middle. They are redeemable at 100 at any time from 1942 to 1972, and the yield on the money at the current price is no more than 4¾ per cent., without making allowance for repayment. Moreover, the supply of stock on offer in the market is very meagre. North Metropolitan Power Station 5 per cent. debenture stock stands at 101, and Perak River Hydro-Electric 5 per cent. debentures at the same price. North Wales Power 4½ per cent. debenture and Tata Power 4½ per cent. debenture are quoted at 96. All these securities are guaranteed by the British Government under the Trade Facilities Acts of 1921-26.

The Mexican Assassination.

Mexican issues of all kinds, Government, railway and utility gave way on the news of the assassination of General Obregon, the president-elect. It was expected that the murder would be succeeded by riots and rebellion in the country, but nothing exciting seems to have happened. Prices were put down when the news arrived, and have not recovered, the falls ranging from 1½ to 3½ points. Mexico Trams have dropped to 30. Anglo-Argentine 5 per cent. debenture stock is 2 points lower at 77½: the company's 4 per cent. debenture and 4½ per cent. debenture stocks are being dealt in on the basis of 75 and 76½, respectively. A further fall left Hydro-Electrics at 32, but International Holdings have been a better market at 14¼, there being a fair amount of support for the latter. Bermuda Traction 7 per cent. debenture is again lower at 6 discount.

An Underwriting Example.

Mention is occasionally made here of the results of underwriting transactions, and possibly the operation of this almost invariable practice is not grasped by those people who, while interested, fail to see how it works out. To take the Bermuda Traction issue as an example, underwriters were left, as we mentioned last week, with 72 per cent. Some of them received 2½ per cent. commission. The man who underwrote £5,000 stock was allotted 72 per cent., that is £3,600 stock, as the public subscription absorbed only 28 per cent. of the whole. His underwriting commission comes to £125, because the 2½ per cent. is paid on the full amount that he underwrites. Therefore his £3,600 stock, issued at par, costs him £3,475, and he can afford to sell at 96½, which is 3½ discount, without losing anything on the transaction.

Cable Stocks Recovery.

Prices in the cable group are moving up and down in remarkably capricious fashion. After last week's falls of 10 points in Eastern ordinary, and £1 in the three shares of the other members of the quartette, the pendulum has swung the other way, and the declines have been more than recovered. Eastern ordinary is up, once more, to 250, Eastern Extensions and Westerns to 25, and Globes to 24¾. The slump in United River Plate Telephones took the price to 9⅞ before the selling "blew itself out," as the Stock Exchange says, and a rally set in, the present price of 9¾ being £1 down on the week. There is no news, so far, of further developments in connection with the Argentine Government's action whereby revision of the company's tariff is called for by that Government. The incident has had no effect on other electrical issues, but led to a weakening in the price of certain gas shares.

Electricity Supply.

Electricity supply shares have given way a little, there being falls in Clyde Valley, County of London, Metropolitans, and Electric Supply Corporation shares. On the other hand, Bournemouth and Poole have strengthened to 8 1/16, London

Electrics to 27s. City of London 4½ per cent. second debenture rose to 88. There is not a great deal doing in this section, nor amongst foreigners are there many changes worthy of note. Whitehall Electric preference further improved to 23s. 9d., and the debenture stock gained a point to 105½. Delhi Electric Supply shares are good at 2¾. Isle of Thanet preference are 2s. 6d. higher at 29s. The County of London and the London Electric Supply Companies have declared interim dividends of 3 per cent. actual on their ordinary shares. The rates are the same as those of a year ago.

Cable Control.

It is announced this week that the cable group, headed by the Eastern Telegraph Co., has acquired the Direct West India Cable Company. Through this, control is obtained of the Cuba Submarine Telegraph, the West India and Panama Telegraph, and the Halifax and Bermudas Cable Companies, giving an extra 8,000 miles of cable to the Eastern. The operation is regarded in the market as a favourable point, and, as already mentioned, it had a strengthening effect upon prices. Marconis have been down to 63s., recovering to 65s. bid. The preference strengthened to 4 5/16. The company's £1 ordinary shares stand at 5½, and there is still a controversy going on as to whether these latter are worth exactly twice as much as the 10s. shares. It may be observed that, if this were the proper mathematical relationship between the two, the £1 shares would certainly not for long be standing at their present figure. Nobody knows at the moment what is the precise relationship existing between the £1 shares, the 10s. shares, and the participating preference, in the event of a voluntary winding-up of the company, which might be deemed desirable as a preliminary to entering into the suggested merger.

The Marconi Statement.

The Marconi Company announces that the profits for the year ended December, 1927, amounted to £430,471, a very material improvement over those of 1926. An interim dividend of 10 per cent., actual, on the ordinary shares, in respect of 1927, is declared, and will be payable on August 13th next. It is hoped to hold the annual general meeting in the autumn. Results for the first half of the current year indicate that the full twelve months' working will show an improvement in profits over 1927. Bulls of the shares elaborate this expectation into an estimate that Marconis are doing exceedingly well this year. The price of the 6½ per cent. convertible debenture stocks stands, it may be of service to add, at 160.

Company Meetings.

Brazilian Tractions have lost a point, at 56½. At the annual meeting, held in Toronto last week, the chairman stated that the June earnings constituted a record. He mentioned that although depression prevailed in Brazil, an industrial improvement was evident, except in textiles. Another interesting meeting last week was that of the Telephone Manufacturing Company, when the chairman made an appeal for protection of the industry. He outlined a modest policy in the matter of dividend-distribution until such time as the company has got into a strong financial position. The price remains unchanged at 6s. for the 10s. shares.

Home Rails and Others.

Home Railway stocks are heavy, and Underground Electric Railways of London shares, together with the income debentures, show small declines. The Metropolitan Railway interim dividend will be declared this week, and will go against 1 per cent. a year ago, a final of 2 per cent. last January making 3 per cent. for 1927. It is thought that there may be a small increase on the dividend paid last August. London and Suburban Tramway 5 per cent. debenture is better at 81. New General Tractions are a florin up, rising to 9s. British Columbia preference hardened to 96½. Lisbon Electric Trams at 16s. are a shilling to the good.

Manufacturing Issues.

Movements amongst the manufacturing companies' shares are somewhat irregular. Metropolitan-Vickers ordinary gave way to 30s. 9d., and India-Rubber shares to 13s. 9d. On the other hand, Enfields at 4 7/16 and British Insulated at 4½ show improvements. In the new issue list, Scottish Power ordinary are again a few pence better at 3s. 6d. premium. Midland Electric new ordinary are 4s. 9d. premium. Egham and Staines new are 36s. 6d., which is 6d. less than the old shares. The weakness in Bermuda Traction 7 per cent. debenture makes a striking contrast to the price of Perak 7 per cent. debenture, which, although a point lower on the week, is still at 118. It may be that some of the more speculatively-minded amongst the Perak debenture proprietors are taking a good profit on part of their stock, and re-investing the money in the Bermuda Traction scrip. An important new finance company, with influential international backing, has been founded in Amsterdam for the purpose of financing and developing electricity schemes. The iron and steel market is too quiet to be interesting, and the rubber markets remain in a condition of placid tranquillity.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1926.	Dividend. 1927.	Price July 23, 1928.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14†	15	3⅞	+⅛	... ...
Brompton Ordinary	1	8⅜	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	26/6	—	5 5 8
City of London	1	10	10	30/9	—	4 11 1
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	37/-	—1/6	4 6 3
County of London	1	7½	7½	38/-	—6d.	3 19 0
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	50/-	—⅛	4 8 0
Kensington Ordinary	1	8	8	26/6xd	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	8½	27/-	+6d.	5 3 8
Metropolitan	1	8	9	2⅜	—⅛	3 18 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	—	4 6 8
Mid. Elec. Power	1	—	15	39/3	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	25/9	—	4 13 2
do. 7% Pref. ...	1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10⅜	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	5	8	8	2⁰/-	—	5 0 0
Scottish Power	1	8	8	30/6	—	5 5 0
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	31/3	—	... ...
Westminster Ordinary	1	6½	6½	27/6	—	5 1 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/9	+3d.	6 6 4
Yorkshire Elec.	1	8	8	34/6	—	4 12 9

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	73	—	5 9 7
Metropolitan	,,	8	8	68	—	4 8 3
do. District	,,	3½	4	75½	—	5 6 0
Underground Electric	£1	1½	5	23/-	—6d.	8 17 0
do. do. Income ...	Bonds	6	6	124	—1	4 16 9

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	100½	—	5 19 5
do Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	10	10	43.9	—⅛	4 9 0
Eastern Extension	10	10	10	25	+1½	*4 0 0
Eastern Tel. Ord.	Stock	10	10	250	+13	*4 0 0
Globe Tel. and T. Ord.	10	10	10	24½	+1½	*4 0 10
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	20	20	38½	—	5 4 0
Indo-European	25	10	10	45½	—	*5 10 0
Marconi	10/-	5	*10	65/-	—⅛	... ...
Marconi-Marine	1	8½	12½	50/-	+1/-	5 0 0
Oriental Telephone Ord.	1	12	12	53/9	—	*4 9 3
United R. Plate Tel.	5	8	8	9½	—1	*4 2 1
Western Telegraph	10	10	10	25	+1½	4 0 0

*Interim.

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅝	—	7 11 9
do. do. 2nd Pref. ...	5	6	6	3½	—	8 2 8
do. do. 5% Deb. ...	Stock	5	5	76	—2	6 9 0
British Electric Traction Def. Ord.	,,	—	—	500	—	... ...
do. do. Pref. Ord.	,,	8	7½	124½	—	6 0 6
Brazil Traction	100	6	7	56½	—1	3 19 8
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	96½	+1	5 3 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	9/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 9
Mexico Trams, 5% Bonds	—	5	5	81	—1½	6 3 3
Mexican Light Common	100	Nil	Nil	71	—8½	... ...
do. 7% Pref... ...	100	Nil	7	80	—	8 15 0
do. 1st Bonds	—	5	5	82½	—	6 1 3
Yorkshire (West Riding)	1	Nil	Nil	7/6	—	... ...

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	45/-	—	*4 9 0
British Elec. Transformer Pref. ...	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4½	+⅛	3 10 6
Brush Ord.	1	10	10	28/9	—	6 19 5
Callenders	1	15	15	4⅞	—	3 10 6
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	—	17/6	—	... ...
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	88	—	5 13 8
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 3
English Electric	1	Nil	Nil	8/-	—	... ...
do. do. Pref.	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	19/3	—	5 2 0
Henley	1	25	25	5½	—	4 5 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—½	... ...
Johnson & Phillips	1	19½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	6	30/9	—1/9	3 18 1
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	27/6	—	5 9 1
Telegraph Construction	12	10	10	25	—	*4 16 2

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

Swedish Foreign Electrical Trade.

Statistics for 1926 and 1927.

THE following tables, based on the recently-issued Swedish trade returns, compare last year's electrical exports and imports with those for the preceding year, showing the increases or decreases. Details of the principal destinations or sources of supply are also given.

Exports.

	1926. 1,000 Kronor.	1927. 1,000 Kronor	Inc. or dec. 1,000 Kronor.
Cells and batteries—			
Total	957	2,170	+1,213
To Great Britain	83	37	− 46
„ Norway	41	185	+ 144
„ Austria	78	—	− 78
„ Russia	14	1,165	+1,151
Boards for electrical apparatus and instruments, fitted—			
Total	794	743	− 51
To Belgium	48	26	− 22
„ Great Britain	35	58	+ 23
„ France	56	44	− 12
Wireless apparatus—			
Total	1,884	2,338	+ 454
To Norway	38	77	+ 39
„ Denmark	201	174	− 27
„ Finland	317	448	+ 131
„ Germany	86	98	+ 12
„ France	47	101	+ 54
„ Spain	51	65	+ 14
Special electrical apparatus (not specified)—			
Total	501	432	− 69
To Norway	38	24	− 14
„ Finland	49	41	− 8
„ Denmark	23	24	+ 1
„ Germany	40	22	− 18
Electrical generators and motors weighing each: Not more than 50 kg.—			
Total	7,415	845	−6,570
To Denmark	434	20	− 414
„ Netherlands	553	27	− 526
„ Great Britain	1,329	134	−1,195
„ United States	557	14	− 543
„ Australia	940	28	− 912
50 to 100 kg.—			
Total	557	641	+ 84
To Norway	44	37	− 7
„ Finland	53	72	+ 19
„ Great Britain	43	73	+ 30
„ Spain	72	69	− 3
„ Argentina	62	49	− 13
„ New Zealand	44	27	− 17
100 to 500 kg.—			
Total	2,654	4,047	+1,393
To Finland	362	502	+ 140
„ Great Britain	204	267	+ 63
„ Spain	225	179	− 46
„ Argentina	190	182	− 8
„ Australia	193	117	− 76
„ Russia	386	—	− 386
500 to 3,000 kg.—			
Total	1,855	2,645	+ 790
To Finland	285	350	+ 65
„ Belgium	170	156	− 14
„ Great Britain	152	120	− 32
„ Spain	173	124	− 49
More than 3,000 kg.—			
Total	2,986	4,648	+1,662
To Finland	416	1,539	+1,123
„ Belgium	290	209	− 81
„ Canada	474	282	− 192
„ Italy	180	389	+ 209
Transformers weighing more than 3,000 kg.—			
Total	2,217	3,025	+ 808
To Russia	768	842	+ 74
„ Belgium	256	62	− 194
„ Italy	267	176	− 91
Electric lamps (metal filament)—			
Total	349	210	− 139
To Finland	60	99	+ 39
„ Denmark	20	50	+ 30
Carbon for electrical purposes—			
Total	487	310	− 177
To Norway	193	62	− 131
„ Finland	81	26	− 55
„ Italy	55	15	− 40
Starting, regulating and reduction resistances—			
Total	880	1,021	+ 141
To Russia	196	259	+ 63
„ Spain	86	80	− 6
„ Australia	48	15	− 33
„ Finland	173	226	+ 53
Stators, rotors, current collectors, magnet coils, &c.—			
Total	506	560	+ 54
To Norway	36	27	− 9
„ Finland	82	57	− 25
„ Great Britain	35	104	+ 69
Oil-break switches (hand)—			
Total	964	571	− 393
To Russia	727	183	− 544
„ Spain	15	5	− 10
„ Great Britain	4	1	− 3
„ Finland	52	76	+ 24
Other switches (except mounted knife switches)—			
Total	461	518	+ 57
To Finland	75	88	+ 13
„ Russia	173	113	− 60
„ New Zealand	43	127	+ 84
Safety appliances, mounted or not—			
Total	469	468	− 1
To Finland	55	39	− 16
„ Poland	41	75	+ 34
„ Netherlands	52	61	+ 9
„ British South Africa ...	61	13	− 48
Telephone apparatus weighing less than 5 kg. per article—			
Total	1,723	1,860	+ 137
To Finland	240	113	− 127
„ Poland	223	369	+ 146
„ Netherlands	180	228	+ 48
„ Spain	125	50	− 75
„ Mexico	87	110	+ 23
„ Argentina	76	202	+ 126
Do., weighing more than 5 kg. per article—			
Total	1,267	1,428	+ 161
To Finland	171	163	− 8
„ Egypt	87	156	+ 69
„ British South Africa ...	182	172	− 10
„ China	115	118	+ 3
„ Argentina	121	83	− 38
„ Chile	118	5	− 113
Telegraph apparatus—			
Total	4,445	6,703	+2,258
To Finland	457	586	+ 129
„ Poland	312	991	+ 679
„ Netherlands	716	1,266	+ 550
„ Spain	96	57	− 39
„ Egypt	606	157	− 449
„ British South Africa ...	184	290	+ 106
„ Mexico	288	422	+ 134
„ Australia	149	23	− 126
Cable and wire (metal sheathed):—			
Of a maximum diameter of 25 mm.—			
Total	655	1,565	+ 910
To Poland	157	287	+ 130
„ Finland	73	86	+ 13
„ Mexico	135	142	+ 7
„ Argentina	76	156	+. 80
Of greater diameter—			
Total	404	626	+ 222
To Poland	80	199	+ 119
„ Mexico	57	69	+ 12
Cable and wire insulated with textile materials, paper, varnish, &c.:—			
Diameter of wire not more than 0.5 mm.—			
Total	464	413	− 51
To Russia	129	131	+ 2
„ Great Britain	87	26	− 61
„ Denmark	34	25	− 9
Do., greater than 0.5 mm.—			
Total	114	192	+ 78
To Mexico	15	7	− 8
„ Netherlands	13	8	− 5
„ Finland	35	34	− 1
„ Russia	9	108	+ 99

Imports.

	1926. 1,000 Kronor.	1927. 1,000 Kronor.	Inc. or dec. 1,000 Kronor.
Accumulators and parts thereof—unmounted cells—			
Total	64	70	+ 6
Germany	62	69	+ 7
Accumulator plates—			
Total	1,640	772	−868
Denmark	24	22	− 2
Germany	1,551	688	−863
Great Britain	5	5	—
U.S.A.	60	56	− 4
Cells and batteries, wholly or partly mounted—			
Total	833	895	+ 62
Denmark	35	15	− 20
Germany	480	443	− 37
Great Britain	139	144	+ 5
U.S.A.	166	288	+122
Boards for electrical instruments and apparatus, fitted—			
Total	100	140	+ 40
Special apparatus for electrical purposes: Röntgen ray apparatus—			
Total	160	180	+ 20
Germany	136	168	+ 32
U.S.A.	4	12	+ 8
Wireless telegraph and telephone apparatus—			
Total	4,691	4,804	+113
Germany	2,309	2,556	+247
Great Britain	614	646	+ 32
U.S.A.	345	122	−223
Other special apparatus for electrical purposes—			
Total	2,894	3,495	+601
Denmark	87	99	+ 12
Germany	1,679	1,921	+242
Great Britain	665	446	−219
Switzerland	56	57	+ 1
U.S.A.	196	313	+117
Galvanic cells—			
Total	2,516	3,294	+778
Denmark	1,096	1,837	+741
Germany	1,267	1,280	+ 13
Generators and motors, weighing not more than 500 kilos each—			
Total	1,800	2,026	+226
Denmark	110	88	− 22
Germany	1,119	1,432	+313
Great Britain	70	73	+ 3
U.S.A.	323	340	+ 17
Ditto, weighing more than 500 but less than 3,000 kilos—			
Total	328	355	+ 27
Denmark	71	37	− 34
Germany	203	202	− 1
Great Britain	26	41	+ 15
Ditto, weighing more than 3,000 kilos—			
Total	67	143	+ 76
Germany	67	44	− 23
Transformers, 100 to 500 kg.—			
Total	29	45	+ 16
Germany	27	34	+ 7
U.S.A.	—	3	+ 3
Transformers, over 3,000 kg.—			
Total	44	152	+108
Germany	19	91	+ 72
Switzerland	10	61	+ 51
Metal-filament lamps—			
Total	2,734	3,229	+495
Denmark	47	35	− 12
Germany	1,311	1,844	+533
Netherlands	1,165	1,036	−130
Austria	72	137	+ 65
Lamp sockets, with and without switches—			
Total	299	422	+123
Germany	279	401	+122
Insulating tubes, steel armoured—			
Total (all from Germany)	11	10	− 1
Insulating tubes, other kinds—			
Total (mainly from Germany)	257	335	+ 78
Carbon for electrical purposes, weighing 3 kilos or more—			
Total	809	944	+135
Germany	454	483	+ 29
U.S.A.	303	421	+118
Carbon brushes—			
Total	74	106	+ 32
Germany	17	22	+ 5
Great Britain	42	61	+ 19
Carbon: Other kinds—			
Total	399	237	−162
Germany	236	157	− 79
U.S.A.	125	56	− 69
Starting, regulating, and reduction resistances, controls, and other electric regulators—			
Total	326	182	−144
Germany	243	140	−103
Bases for incandescent lamps—			
Total	53	77	+ 24
Germany	11	20	+ 9
Netherlands	42	57	+ 15
Stators, rotors, current collectors, magnet coils, &c., weighing not more than 50 kilos—			
Total	341	334	− 7
Denmark	8	9	+ 1
Germany	258	249	− 9
Current interrupters and reversers, oil brake switches, hand-operated—			
Total	52	44	− 8
Germany	46	35	− 11
Box, knife and other switches—			
Total	837	1,057	+220
Germany	693	855	+162
Safety appliances, not specified—			
Total	545	760	+215
Germany	526	741	+215
Electricity meters—			
Total	809	1,139	+330
Germany	721	1,052	+331
France	48	61	+ 13
Other electrical measuring instruments—			
Total	564	555	− 9
U.S.A.	47	50	+ 3
Germany	425	446	+ 21
Porcelain insulators, conduit pipes, &c.—			
Total	690	601	− 89
Denmark	7	7	—
Germany	635	582	− 53
U.S.A.	17	7	− 10
Electric lighting fittings of brass, coated, varnished and lacquered—			
Total	96	90	− 6
Germany	67	64	— 3
Cables and cords with sheaths of lead or other metal; maximum diameter 25 mm.—			
Total	498	746	+248
Denmark	43	101	+ 58
Germany	443	593	+150
Ditto, of greater diameter—			
Total	799	1,491	+692
Denmark	34	67	+ 33
Germany	751	1,406	+655
Ditto, not specified—			
Total	635	955	+320
Denmark	69	70	+ 1
Germany	370	582	+212
Netherlands	54	124	+ 70
U.S.A.	49	39	− 10

(£1=about 17 kr.)

A Swedish Automatic Power Station.

An automatic hydro-electric power plant, run entirely without human hands, has just been put into use by the Surahammar factory in Sweden. This plant, said to be the first of its kind in Europe, is automatically started and controlled from the telephone exchange of the factory, situated at some distance from the power plant: at the exchange all observations concerning the functioning of the plant, the speed of the machines, the water level, &c., are automatically made and registered. The turbines automatically adapt themselves to the quantity of running water, and the starting of the entire machinery is effected by simply pressing a button at the control desk of the exchange. So far, the installation has functioned perfectly, we understand, and the company is contemplating adapting its other plants to automatic control.

The Public Lighting Conference.

An account of the proceedings at the conference and annual general meeting of the Association of Public Lighting Engineers at Sheffield.

(*Continued from page* 125.)

BEFORE the resumption of business on July 11th, the second day of the Conference, the president, accompanied by a large gathering of members, placed a wreath on the Sheffield Cenotaph on behalf of the Association. On reassembling at the Town Hall, the gathering stood in silence to pass a vote of condolence with the relatives of the late Mr. H. Dickinson, city electrical engineer of Liverpool, and of the late Mr. Leon Gaster, founder and secretary of the Illuminating Engineering Society.

What the Public Wants.

By Councillor F. THRAVES.
(*Chairman of the* SHEFFIELD WATCH COMMITTEE).

(*Abstract.*)

The pedestrian.—Street crossings have to be negotiated, and in these cases sufficient light is a vital necessity. It is difficult to express preference for any one type of lighting as against others, but it would appear that lamps placed alternately on both sides of the street is considered much the best; also in the main thoroughfares of a town the lighting should be so good that powerful headlights of motor vehicles, with all their discomfort and danger, should be so unnecessary as to be prohibited. In the suburbs and on the arterial roads, one cannot be surprised if pedestrians prefer the smooth roadway to the uncomfortable footpath, thus rendering public lighting all the more necessary. Poor lighting, with lamps very far apart, while not very satisfactory, is a great deal better than no lighting at all. The blinding effect of motor head-lamps is very much less where there is some measure of street lighting. My requirements in this direction as a pedestrian I know are contrary to my requirements as a motorist.

The Motorist.—Those who do a lot of night motoring all agree that a badly lighted street is much worse to drive along than an unlighted street, particularly on a wet night. Street lighting with the lamps placed on one side only is dangerous. The standard lamp in use throughout the country is rather on the short side, because it clashes with shop-window lighting in many instances.

An extended use of illuminated caution signs to indicate danger points and bends on the road would be very useful, and it is surprising how few local authorities have dealt with the question with any degree of seriousness.

In cities where the main roads are comparatively well lighted, and on which one can drive with safety and comfort, there is sometimes a danger in turning from a well-lighted main road into an unlighted (or poorly lighted) side road, and it is suggested that the first two or three lamps in the side street should be of a greater candle power than the other lamps in that street. Preference is expressed by some motorists, although not all, for lamps over the centre of the roadway and very high up, because they shorten the shadows cast on the roadway by passing vehicles. One motorist expressed the opinion that intermittent advertising signs should not be permitted, particularly in poorly lighted areas. The lighting of the older portions of a city with narrow, tortuous streets is even more important to the police than the lighting of broad, straight thoroughfares. They would like the former places so lighted as to leave no dark spots; undoubtedly good street lighting does help the police. From the point of view of controlling road traffic, quite another standard of lighting is required.

The Ratepayer.—At the present time, street lighting in Sheffield costs ¼d. per week per head of the population, and I do feel that as a ratepayer it is fair and just that I should be asked to pay for street lighting to the requirements of the pedestrian and of the police, but I do not feel that it is right that I should be asked to bear the whole cost of meeting the requirements of motorists. The infinitely higher standards of lighting brought about by the great increase in motor traffic should be met by the motorists themselves, possibly through the Road Fund; the question is now a National one.

Discussion

Councillor MELLING (Sheffield Watch Committee) said that as a motorist of many years' standing he felt very strongly that the financial burden of street lighting, becoming more and more serious for every local authority as fast traffic increased in volume, ought to be borne in part by the motoring community itself; if the Road Fund could spare anything at all, it should be spared to assist local authorities in their street-lighting problems.

Alderman GORDON (Liverpool) entirely agreed with the suggestion that it was a mistake to have too great a change from a brilliantly lighted city thoroughfare to gloom in another street, or *vice-versa*.

Baillie JAMES MACDOUGALL (Glasgow) said from his experience in public lighting he was convinced that if the lighting engineer, or inspector, of a locality produced evidence that he had need of equipment or material for better lighting, every possible facility should be given him. The problem was common to all communities, because they were all in the same position of difficulty with regard to finance. The need for the fullest efficiency in street lighting, for the protection of the public at large against speedy motorists, 'buses and tramcars, was greater than ever it had been.

Votes of Thanks.

On the motion of Mr. R. Beveridge (Edinburgh), seconded by Mr. Wardle (Liverpool), the Conference passed hearty votes of thanks to the authors of the papers; also, on the proposition of Alderman Jos. Taylor (Bolton), seconded by Mr. Alex. C. Cramb, ex-president, to the Lord Mayor and Corporation of Sheffield for the generous hospitality and accommodation afforded for the Conference. Appreciation of the past year's services of the retired president was voiced on behalf of the Conference by Mr. C. C. Paterson (London), seconded by Alderman Gordon (Liverpool); and thanks were awarded the Council for its services on the motion of Councillor Adams (Edinburgh), seconded by Councillor Minshall (Sheffield). The Lord Mayor of Sheffield (Ald. M. Humberstone) and Mr. Cramb briefly responded.

Election of Officers.

The result of the election of Council and officers was as follows:—

President: Mr. J. F. Colquhoun (Sheffield).

Vice-president: Mr. N. Wright (Bournemouth).

Council: Messrs. W. H. Chapman (London), H. Davies (Chesterfield), R. Davison (Newcastle-upon-Tyne), S. B. Langlands, J.P. (Glasgow), R. Mason (Birmingham), C. S. Shapley (Leeds), M. H. Wardle (Liverpool), T. Wilkie (Leicester), and C. I. Winston (London).

Hon. Editor: Mr. E. J. Stewart (Glasgow).

Hon. Treasurer: Mr. E. M. Severn (London).

Excursion.

In the afternoon on July 11th motor coaches conveyed the visitors, under delightful weather conditions, on a most enjoyable tour of the Derbyshire dales country; tea was served at Buxton, where the party was met by the Lord Mayor of Sheffield and the Mayor of Buxton.

Annual Dinner.

On returning to Sheffield in the evening the Association's annual dinner took place at the Grand Hotel, a very pleasant function over which the president, Mr. J. F. Colquhoun, presided.

Alderman JOHN GORDON (Liverpool), in proposing the toast of the Association, said he did not know of any conference of the Association which had been as good as that one, and he also paid a tribute to the work of Mr. W. J. Liberty, the secretary, who had done a tremendous amount of excellent work.

Mr. A. C. CRAMB responded, remarking that criticism had been levelled at the Association and people wanted to know what justification it had for its existence, but the progress that had been made in street lighting was evidence enough of justification. The special installation which they had viewed on the previous night had been of material advantage to them in demonstrating what their specifications meant. They were glad to have had the assistance of the National Physical Laboratory in their work. He expressed the view that the Association's subscription was too small.

Alderman J. TAYLOR (Bolton) toasted the Corporation of Sheffield and commented upon the splendid time the Association had had and on the excellence of the city. He suggested that Mr. J. F. Colquhoun should get all the financial assistance he required for his excellent work and that all town and city councillors should help their lighting engineers in that direction.

The LORD MAYOR, in responding, congratulated the Association upon the splendid work it was doing. Sheffield was making more steel than in 1913 and employed more steel workers than in 1913.

"The President" was proposed by Bailie J. MACDOUGALL (Glasgow), who said that Glasgow was proud of Mr. J. F. Colquhoun, who had received his early training in that city under their lighting engineer.

Mr. COLQUHOUN contented himself by briefly thanking the Bailie and those present for what had been said about him.

Councillor H. R. MINSHALL (Sheffield) toasted the visitors, on whose behalf Mr. John Terrace replied.

Works Visits.

The conference gathering ended on Thursday, July 12th, when members visited various cutlery and silver-ware works in Sheffield, as well as the Ruskin Museum, the Mappin Art Gallery and Museum, and various other places of interest.

A meeting of the Committee of the Engineering Standards Association, responsible for the Street Lighting Specification, was held on Thursday evening for the purpose of viewing and discussing the effectiveness of the installation as erected in accordance with that specification.

Street Lighting Demonstration.

The street lighting display which was arranged in Sheffield by Mr. J. F. Colquhoun, city lighting engineer (referred to last week in his presidential address), consisted of nearly 50 distinct installations, most of the leading types of public lighting equipment being represented, amongst which were the following:—

GENERAL ELECTRIC CO., LTD., exhibited fittings of six different types, classed as:—

Type 1 consisted of standard "Wembley" lanterns, model FC.6046, equipped with symmetric one-piece prismatic glass refractors and 1,500-watt "Osram" gasfilled lamps.

Type 2 was similar, but equipped with 1,000-watt lamps.

Type 3 comprised standard model FC.6047 "Wembley" lanterns, also fitted with refractors, but with 500-watt lamps.

Type 4 was perhaps the most interesting, for it comprised the standard model FC.6047 "Wembley" lantern fitted with a new type patented G.E.C. asymmetric elliptical one-piece prismatic glass refractor.

Type 5 was the standard FC.6047 "Wembley" lantern fitted with symmetric refractor and 300-watt lamps.

Type 6 was a lantern of the housing type without a refractor.

Installations of types 2 and 5 are used in various parts of Sheffield as part of the normal method of street lighting, but for the purposes of the demonstration a number of them were specially installed in the new Prince of Wales Road, which is some 2¼ miles long, and forms a boulevard with a central double-rail tramway track, with a carriage-way on either side for ordinary vehicular traffic; the tramway track is edged by a grass sward, and the illumination in the ordinary way is carried out by lanterns mounted on the central tramway poles.

During the Convention the new refractor mentioned above was introduced to the delegates: the ratio of the candle-power intensity at the angle of the peak to the intensity in the downward vertical direction (magnification factor) equals 6.5 : 1, and it was designed advisedly to give this particular magnification ratio for the purpose of securing maximum economy in current consumption consistent with the avoidance of extreme asymmetry with its excessive glare. It is claimed to be the only type of one-piece asymmetric street-light refractor in the world, fashioned in a double prismatic formation on one thickness of glass, and has therefore only half the loss of light of its prototypes. By the use of specially designed totally-reflecting prisms at the top, the light rays which do not normally reach the street surface, even when a refractor of the ordinary type is employed, are directed downwards on to the roadway. There is no obstruction of light such as is found with a totally-enclosed refractor, with the result that in the lower hemisphere a large proportion of the light rays pass without absorption to the surface of the thoroughfare, thus increasing the efficiency of the device to a marked extent. An additional advantage of the shape of this refractor lies in the fact that when it is being installed all that is necessary is to place the major axis of the refractor at right angles to the street. Interchangeability with standard G.E.C. symmetrical one-piece prismatic refractors fitted to the standard "Wembley" lanterns is secured without the necessity for structural alterations to existing lanterns, or to their wiring, beyond the substitution of a slightly different shaped refractor fixing-plate to accommodate the new elliptical refractor, in lieu of that which accommodates the standard symmetric refractor. To secure rigidity of lanterns fitted with the new refractors, a special adaptor for permanent attachment to the bracket arm carried by the column is substituted in lieu of the usual type of insulated shackle suspension; rigidity of fixation is necessary as the light distribution would be affected by movement to a far greater extent than when refractors of the symmetrical type are used. Great interest was evinced in this installation, and the test readings yielded some exceedingly interesting results.

NORRINGTON & LANDON, LTD. (London and South England agents: Lewens & Wilkinson, Ltd.). The "Blaizolite" lantern has a cylindrical body enclosing a system of seven plano-convex lenses and six mirrors surrounding the lamp bulb which forms the centre of the system; six of the lenses are mounted round the lamp and opposite to each of them is a mirror which can be so adjusted that the light can be reflected at the desired angle; the 7th lens is mounted in front of the bulb between it and the diffusing-glass front. The six mirrors are hinged at their inner edge, the outer edge being fastened to a quadrant passing through the backplate, where it is secured at the desired position by wing nuts. Each mirror may also be rotated through slots in the backplate in the plane of the latter. The lantern is enclosed by hinged doors at the back and front, so arranged that the opening of any door may be reversed, and the front door frame carries a sheet of hammered cathedral glass which effects the requisite diffusion. The lantern is mounted on a trunnion with base-plate and wing nut, so that it can be rotated simultaneously in both the vertical and horizontal planes.

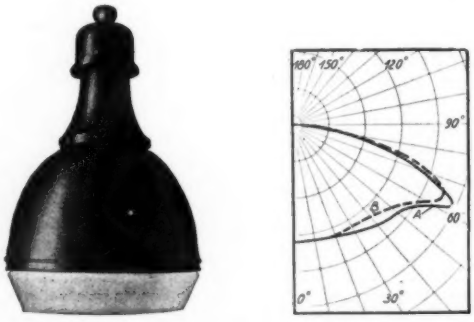
METRO-VICK SUPPLIES, LTD., installed six "Caledon" lanterns, No. 7,504 (fig. 1) with 2-way non-axial 160-deg. reflectors and 300-watt lamps, each reflector giving two beams at 160

Fig. 1.—Metro-Vick "Caledon" Lantern.

deg. The carriage way is 40 ft. wide and the average distance between the lamps 106 ft. They were mounted at a height of 25 ft. on brackets projecting 6 ft. over the carriage way. The spacing height ratio was 4 to 2. The horizontal illumination resulting was: minimum = 0.25 foot-candle, and maximum = 0.45 foot-candle; ratio, minimum to maximum = 1 : 2. This installation came within Class "D" of the B.E.S.A. Specification and proved of special interest: we quote relevant remarks from the presidential address: "Installation 38 has given us a most interesting experience. The magnification in the refractors used is approximately 12, and with 500-watt lamps fitted the glare was distinctly harmful. . . . Visibility was distinctly impaired by it. . . . The 500-watt lamps were taken out and 300-watt put in. The glare was very considerably reduced and there is a marked improvement in visibility . . . and it is interesting to note that it is possible with certain fittings to improve visibility by reducing the size of the lamps used with them. . . . No-one complains of the uniformity or drabness of installations 38 and 46."

ELECTRIC STREET LIGHTING APPARATUS CO.'s installation consisted of the usual short type of column elongated by means of "unit system" single-arm extension brackets so as to raise the height of the light source 13 ft. 6 in. above ground level. The small size "Bi-multi" reflectors, which can be used without globes or lanterns and can be easily attached to any form of bracket or swan-neck, were fitted with 75-watt gasfilled lamps. This type of reflector is claimed to furnish approximately seven times the illumination that would be available from the lamp alone, in the direction along the length of the street.

KORTING & MATHIESEN ELECTRICAL, LTD., installed seven "Mirrorlite" lanterns (fig. 2) both with and without diffusing glass bands attached to the lower edges of the reflectors; these conically-shaped rings screen the lamp filament from view and throw a small portion of the light upwards, so



Figs. 2 and 3.—"Mirrorlite" Lantern and Polar Curves; A with ring filament, B with zigzag filament.

illuminating the fronts of adjacent buildings without the formation of shadows and preventing glare. A spacing distance of from 5 to 5.5 times the mounting height is recommended. The cast-iron canopy is secured by screws to the sheet-steel outer cover, which protects the glass mirror reflector mounted

within it; the reflecting medium is pure silver deposited by a special process and the shape of the reflector effects lateral distribution of the light (see polar curves fig. 3). The mirror is cooled by air circulation in a space between it and the outer metal dome and, as the lantern is quite open at the bottom, there is free access of air for cooling the inner surface of the mirror and the lamp itself. The lantern is also easy to clean as it has no enclosed globe or exposed flat surfaces to collect dust. The "Goliath" lampholder is adjustable, so that lamps of from 300 to 1,000 watts can be focussed by means of a simple gauge.

WARDLE ENGINEERING CO., LTD., had four installations of "Bruce" lanterns equipped with 500- and 1,000-watt lamps, three of them having "Holophane" dome refractors and the fourth a two-way band refractor. These lanterns consist of a cast-iron cowl which carries two mild-steel rust-proof rods and one screwed brass rod, which support the c.i. frame of the one-piece spun-copper body and refractor. The hinged support of the copper reflector is screwed to the c.i. frame and, in addition, is soldered to the body; the lantern is thus reinforced and the copper body carries no weight. Vibration-proof lampholders are incorporated and lamp adjustment is effected by rotation of an external focussing head. The lantern is ventilated and stormproof.

(To be concluded.)

The Colliery & Mining Exhibition.

A General Account of the Electrical Exhibits.

(Concluded from page 127.)

THE show was the fourth of its kind held in Manchester, and, although there were 91 exhibitors, it was regarded, from a mining point of view, to have been insufficiently representative of the industry, perhaps in some measure due to the fact that there seems to be a growing tendency amongst manufacturers to ignore exhibitions as being too costly, relatively to the amount of trade that results therefrom, and the feeling that the money expended thereon can be employed to better purpose in other forms of publicity.

Metro-Vick Appliances.

Out of a wide range of apparatus manufactured for practically every electrical application in colliery work, the Metropolitan-Vickers Electrical Co., Ltd., exhibited a selection of motors, switchgear, and control gear of both ordinary industrial types for use above ground and in non-fiery mines, and also flameproof types for use in workings where Regulation 132 of the Coal Mines Act applies.

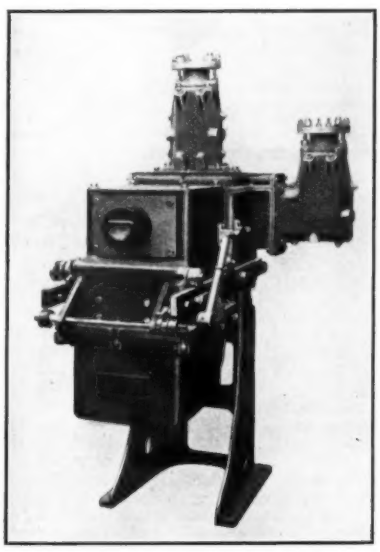


Fig. 1.—Flame-proof Switch Pillar.

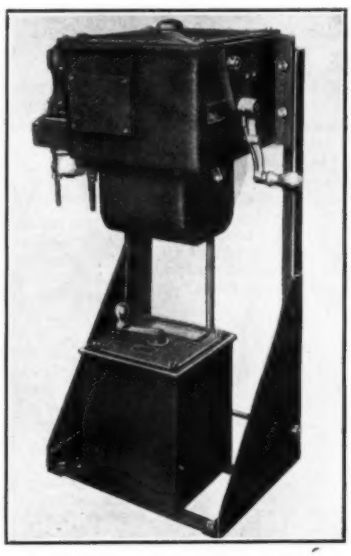


Fig. 2.—Switch Pillar and Rotor Starter.

Examples of new ball- and roller-bearing motors were exhibited, designated respectively type "S" (squirrel cage), type "W" (wound rotor), and type "MS" (squirrel cage mining pattern); in the last-named type provision is made for mounting on either side of the yoke a terminal box to which is attached a compound-filled trifurcating box with an earthing clip, so that the entry of the cables can be made flame-proof, and the motor can be furnished with a starting switch mounted on an end bracket when required. A feature of these machines is their small overall height, which is important in connection with the driving of conveyors, loaders, &c., at the coal face. A type "MW" (slip-ring mining type) has also been developed, and the construction of these machines is such that they can be dismantled and reassembled without disturbing the press fits of the bearings, thus obviating the necessity of skilled labour for refitting after inspection and cleaning; types "S" and "W" (fig. 3) have end-brackets which can be adapted, or converted, to any desired type of enclosure and ventilation system, and the type "MS" has flame-proof casing as standard.

The type "SF" switch pillar of 250 amps. capacity at 3,300 volts (fig. 1) represented a range which has been extensively adopted for mining and industrial applications. Made for service up to 3,300 volts with flame-proof enclosure and up to 6,600 volts with non-flameproof enclosure, the oil circuit breaker with loose handle gives a high-speed break. It is arranged to slide upon aligned steel bars fixed to the pillar, and when withdrawn from the sockets the breaker and all accessories are completely isolated; the instrument transformer compartment and the bus-bar chamber are compound filled. Dwarf pillar mounting can be made to suit low headroom in colliery workings, and fig. 2 shows type "OMS" pillar of smaller capacity for non-flameproof service, simplified to reduce initial and maintenance costs by robust construction and making all renewable parts easily replaceable. Both these types of pillar can be made to form convenient single or multiple switchboards, in the latter case provision being made for safely isolating individual switches from the bus-bars when required. Either type of switch can also be mounted in combination with a rotor starter or auto-transformer starter to form a complete starting unit giving protection against overload and failure of supply; in such combinations the circuit breaker can be interlocked with the starter or with brush-lifting and short-circuiting gear. Fig. 2 also illustrates a type "OSV" rotor starter on the type "OMS" pillar described. It is made in flame-proof and non-flameproof types for a.c. motors up to 150 h.p., with switch mechanism of the face-plate type, immersed with the necessary resistances in a welded steel tank of oil. Type "OML" starter (fig. 4) is flame-proof, and can be arranged for direct star-delta, series-parallel, or auto-transforming starting. It is made in standard sizes for motors up to 100 h.p. on circuits up to 650 volts, and is particularly suitable for the control of pumps, fans, screening plant, &c. For a.c. motors driving haulages, pumps, and other equipment for which speed regulation is required, an effective controller is the type "MFA" drum with suitable resistances. The range built provides for service up to 160 amperes continuous, or 240 amperes intermittent, on circuits up to 3,000 volts; above 650 V the controller is used in the rotor circuit and interlocked electrically with a separate oil-immersed h.p. reversing contactor switch controlling the stator circuit. The "MFA" controller is of the air-break type with arc shields, and is flame-proof.

The gate-end box and control switch which constitute the equipment of the Company's system of protection for gear used at the coal face is especially applicable to coal-cutters and coal-conveyors driven by directly-started squirrel-cage motors. The flame-proof gate-end box contains a main contactor with protective and re-setting devices, arranged for installation at the end of the feeder line, and is completely controlled by a flame-proof switch mounted in the coal-cutter or conveyor. An important feature is that the control circuits are at a pressure not exceeding 20 volts, and no main current connections are made or broken at the controller.

Kent Meters.

A complete range of meters for the measurement of steam, water, compressed air, gas, and other fluids is made by Messrs. George Kent, Ltd., but from the electrical angle, the outstanding exhibit was an electromagnetic water-level indicator for use with water-tube boilers; the indicating instrument is virtually a mercury U-tube, one side of which is connected to the water space of the boiler drum, the other side to the steam space; this can readily be done by inserting tee-pieces between the gauge glass fitting and the boiler. The connection on the steam side has a condenser, so that the level of the water in the boiler is balanced against a column of water of fixed height; therefore, any change in water level will produce a corresponding change of level of the mercury in the U-tube. The mercury U-tube is in the form of two equal cylinders, with a connecting passage at their lower ends; riding on the surface of the mercury in each cylinder is a float, and attached to each float and rising vertically into a copper tube is a steel rod carrying a soft-iron armature, the movement of which is transmitted to the exterior by means of an electromagnetic gland. Placed centrally between the copper tubes is an electromagnet with a soft-iron core pivoted horizontally. Rigidly attached to the core are two bars, to the two ends of which are fixed pole tips fitting close to the exterior of the copper tube on either side of the soft iron armatures. As the magnetic circuit is nearly complete, any movement of the armatures is transmitted to the pole tips, thence through the connecting bars to the electromagnet core, which is given an angular movement proportional to the change of level in the boiler; the angular movement is transmitted by means of a suitable multiplying gear to the indicator pointer. To remove all chance of sluggishness the exciting current of the electromagnet is interrupted a number of times per second, so imparting to all the moving parts a vibrating motion which removes every trace of inertia, so much so that a change of level of 1/16 in. is readily indicated.

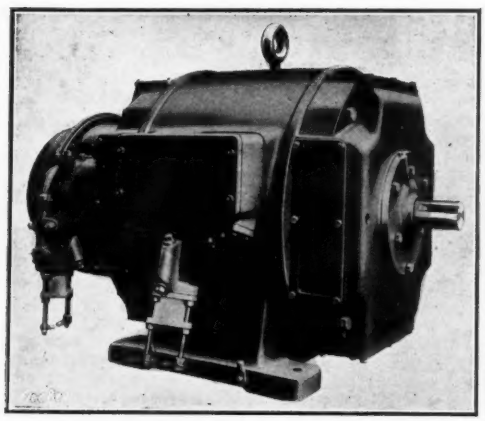


Fig. 3.—New " Metrovick " Slip-ring Motor.

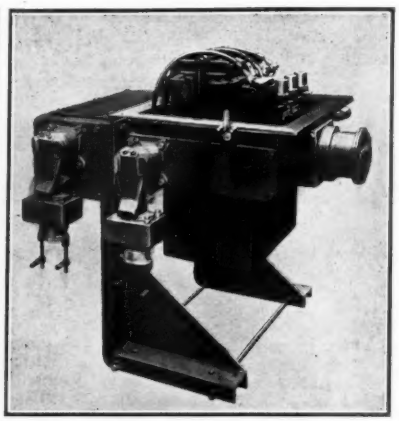


Fig. 4.—Flame-proof Motor Starter.

Batteries, Ltd.

Another concern that concentrates on miners' lamps, accumulators, and charging installations, is Batteries, Ltd., of Redditch. The new " Nife " miners' lamp is extremely light in weight, only 5¼ lb., and its fluted drawn-steel body is of exceptional strength. Light flicker is prevented by a spring contact arrangement, and the whole can be dismantled by loosening two screws; below and above the bulb are specially designed white enamelled reflectors. On this stand there was on view a complete charging installation, including charging rack and special filling trolley which enables the batteries to be automatically topped up to the correct height. The charging rack suspends cells by their terminals; they do not rest on insulators. The particular rack on view held 50 cells, but it can be extended for any number. Also shown was an interesting range of cells of from four to 400 amp.-hours, as used for electric locomotives, emergency lighting, signalling, &c.

Ediswan Display.

The Edison Swan Electric Co., Ltd., had as its principal exhibit a drum of 0.25 sq. in. three-core solid bitumen d.w. shaft mining cable, and a sample case showed the various stages of manufacture in the metamorphosis of copper rods through about 18 processes to the completed cable. Other cases featured cab-tire-sheathed trailing cables, standard types, cradle types, and hard cord braided types, three-core solid bitumen, double wire-armoured, shaft mining cables, &c.

Holland Compressors.

Rotary vacuum pumps and air compressors were the main exhibits of Bernard Holland & Co. One piece of machinery on view weighed 3½ tons, and consisted of an in-bye set made up of a Holland/S.L.M. K.C.30 two-stage rotary air compressor directly coupled to a totally-enclosed electric motor, mounted on a trolley for running on rails. It had an output 174 cu. ft. of free air per minute at 980 r.p.m., water-cooled intercooler, automatic governor, suction air filter, oil separator, radiator, fan and water pump.

Royce Cranes.

Messrs. Royce, Ltd., exhibited a 1- to 8-ton electrically-driven crane fitted with a 10-b.h.p. hoisting motor, and arranged for a total height of lift of 71 ft. 6 in.; a 1- to 50-b.h.p. direct-current motor of the enclosed ventilated type; two direct-current drum-type reversing controllers, such as are used for cranes, transporters, or winches; and an a.c. drum-type controller and one a.c. brake magnet.

Scientific Instruments.

Five stands were devoted to displays of scientific control instruments, including CO_2 recorders, mainly for the control of boiler plant and mine-signalling apparatus. Messrs. Alexander Wright & Co., Ltd., contributed dead-beat pressure indicators, CO_2 recorders, CO_2 and draught indicator and recorder; the Budenberg Gauge Co., Ltd., recording filters, dual depth gauge, boiler gauges, &c.; Siemens Bros. & Co., Ltd., mine-shaft signalling apparatus; Duguids, Ltd., Vernier draught gauge, tube gauges, &c.; Industrial Combustion Enineers, Ltd., Bailey fluid meters; Electroflo Meters Co., Ltd., meters, boiler-control panels, multipoint draught indicators, multiple recorders, turbine efficiency meters, &c., the latter instrument giving a complete picture of turbine operations on wide strip chart, including primary steam flow, extraction steam flow, and condensate flow. The Cambridge Instrument Co., Ltd., made a big display of electrical recording instruments, including CO_2 apparatus, distance thermometers of the electrical resistance and mercury-in-steel types, mechanical thermometers, thermo-electric pyrometers, stator and rotor outfits, dial gauges, &c.

Ventilation, Heating and Lighting.

The report of the Industrial Fatigue Research Board to the Medical Research Council for the year 1927 was issued recently (H.M. Stationery Office, price 9d. net). Amongst other matters it deals with the physiology of ventilation, quoting a report issued in 1926 to the effect that in order to reduce the temperature gradient between the feet and the head the system of heating should invoive radiating surfaces of fairly low temperature, placed near (or even below) the floor, and, secondly, that the plenum system of ventilation, in which the air is propelled into the room, though it may be inevitable in certain kinds of factories, compares disadvantageously with other systems. During the year this investigation has been extended to include certain forms of radiant heating, particularly panel heating, a method which is now being widely adopted in buildings, the essential feature being the maintenance of large surfaces at a moderate temperature whence heat is radiated in all directions. The results of this second investigation suggest that the chief advantage of radiant heating is the remarkable uniformity of temperature induced by it throughout the room, and the consequent absence of the steep vertical gradient that often accompanies heating by convection. On the other hand, little confirmation has been found of the claims sometimes made for radiant heating, namely, that it differs from other systems in possessing certain inherent qualities productive of comfort and in ensuring comfortable conditions at a much lower air temperature.

With regard to illumination, the lighting conditions of composing rooms have been the subject of further study. In an earlier investigation it was shown that, with other conditions constant, output increased and errors diminished with illumination up to about 20 foot-candles, a standard considerably higher than is usually found in practice. The investigation has since been extended to cover the distribution of the light over the working area, or the system of lighting tending to give the best results with a given illumination. For this purpose the illumination was kept constant at about 10 foot-candles. The results of the second investigation, which have now been published, are less definite, but tend to show that local lighting (a system in common use) is inferior to general lighting, whether direct or semi-indirect, and that this inferiority is accentuated whenever glare from the light source is present.

The Royal Agricultural Show.

Electro-farming Conference and Exhibits at the Royal Show.

(*Concluded from page* 128.)

An interesting combination shown by the WOLSELEY SHEEP SHEARING MACHINE CO., LTD., was an electric sheep-shearing set which could also be used for house lighting. It consists of a "Wolseley" 2½-h.p. vertical petrol engine, water cooled, driving by silent chain a dynamo of 1-kW output. The set is mounted in a steel-tube frame on a wheeled truck, the frame being made telescopic for convenience in storage or transportation. The speed of the engine can be varied (under the control of the makers' patent governor and slow-running device) from 400 to 250 r.p.m. No battery is supplied with the set. When it is not in use for either of the above-named purposes, the set can of course supply power for pulping, chaff-cutting, milk separating, and other light duties within its range of power.

Messrs. AJAX, LTD., showed their new patent process for the irradiation of milk with ultra-violet rays; the apparatus, which is of British manufacture, comprises two 10-gallon tanks, the milk passing from one to the other down a chute of prismatic glass which causes the stream to be broken up into short waves, thinning out at the crest, while it is subjected to the rays from a mercury-vapour lamp. It is claimed that by this process vitamin "D" is increased, whilst vitamin "A" is not destroyed.

The "Hinman" electric milking machine was shown on the Corporation stand by ASSOCIATED MANUFACTURERS' CO. (LONDON), LTD. The components of this machine are exceedingly simple, and easy to clean, and it is claimed that the milker, by gradual suction and complete release alternately, exactly reproduces the natural process of milking.

Amongst a variety of exhibits, Messrs. PETTERS, LTD., showed their electric generating sets, of from 1½ to 12 h.p., working either with crude oil, or with paraffin or petrol as fuel. Messrs. RUSTON & HORNSBY, LTD., showed, in addition to agricultural machinery, a 1½-kW electric lighting set, and oil engines of sizes up to 100 b.h.p.

Messrs. RANSOMES, SIMS & JEFFERIES, LTD., showed in their stand an entirely new model induction motor of 2½ h.p., specially designed for agricultural purposes, which is illustrated in fig. 1. This motor is of the squirrel-cage type, and

Fig. 1.—Portable Agricultural A.C. Motor.

is mounted on a carriage for easy transport. The same makers' 10-b.h.p. d.c. motor for agricultural work, and three types of other electric motors for both alternating and direct current, were also shown. In addition, a Ruston & Hornsby 7-b.h.p. generating set was shown driving farm machinery adapted with Messrs. Ransomes' drip-proof-type electric motors, a root cutter and cleaner, chaff cutter, grinding mill, &c.

Messrs. DAVEY, PAXMAN & CO., LTD., also showed crude-oil engines, up to 120 b.h.p., with the "spring-injection" system and the Paxman-Lentz valve gear.

Other exhibits of electrical interest on the Corporation stand were those of the British Thomson-Houston Co., Ltd., the General Electric Co., Ltd., Metro-Vick Supplies, Ltd., and Messrs. Siemens & English Electric Supplies, Ltd. (domestic electric appliances); Hurley Machine Co., Ltd. (washing machines); Messrs. F. W. Brackett & Co., Ltd., and Drake and Gorham, Ltd. (pumping sets); Messrs. W. J. Furse & Co., Ltd., Electrolux, Ltd., the Freezone Co., Ltd., and the Haslam Foundry & Engineering Co. (refrigerators); British Hanovia Quartz Lamp Co. (Scholl milk irradiation lamp and sunlight treatment); Messrs. Hodgson & Hodgson, and Messrs. Spratt's Patent, Ltd. (electric incubators); Messrs. Bull Motors, Ltd. (5-h.p. motor); Messrs. Pearson Bros. (wireless apparatus); and Simplex Conduits, Ltd. (switchboards).

On the stand of the Nottingham Corporation Electricity Department was shown the "Farmer's Boy," a portable electric power unit, manufactured by Messrs. ELECTROMOTORS, LTD., Openshaw, Manchester, which has been designed specially for general farm work (fig. 2). It consists of a motor of about 5 h.p., chain driving a countershaft on which are mounted two pulleys. A third pulley is mounted on the motor shaft, so that a choice of three belt speeds is available, enabling all

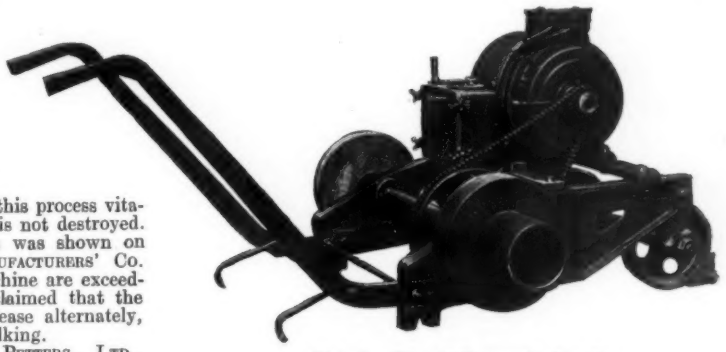


Fig. 2.—The "Farmer's Boy."

classes of machinery to be driven, such as chaff cutters, root slicers, dairy machinery, cake breakers, and, in fact, any machine on a farm where power is required. In addition, a grindstone is mounted on the countershaft, so that agricultural implements may be readily sharpened. As the whole equipment is mounted on a truck, which can be moved about from place to place by one man, like a wheelbarrow, it is a simple matter to provide a convenient drive for any piece of machinery. It is only necessary to wheel the "Farmer's Boy" into position, give a reasonably tight belt, kick the chocks under the wheels, put the stake provided into the ground to prevent movement, and plug the length of flexible cable into the nearest socket; the total weight is 540 lb.

In addition to this exhibit, Messrs. Electromotors, Ltd., had a large generator on the stand of the NATIONAL GAS ENGINE CO., LTD., directly coupled to one of that company's engines.

Messrs. R. A. LISTER & CO., LTD., exhibited electric shearers which can also be used for clipping horses and cattle; the

Fig. 3.—Motor-driven Cream Separator.

hand-piece is vibrationless and cool-running, and the ball-bearing motor is totally enclosed, a.c. or d.c. Electrically-driven cream separators (fig. 3) were also shown, and a range of lighting sets, including new 600-watt plant specially built for small farm houses and bungalows.

The International Union of Producers and Distributors of Electricity.

A Report of the Proceedings at Paris, by our Special Correspondent.

THE second biennial congress of the Union Internationale des Producteurs et Distributeurs d'Energie Electrique, of which Signor Giacomo Ponti, of Italy, is president this year, was opened on Thursday, July 5th, in Paris by Mr. André Tardieu, Minister of Public Works of the French Government; he welcomed the foreign members of the Union in the name of the Government, and congratulated the Union on the progress which had been made in the four years since its birth, starting as it did with three countries, France, Belgium, and Italy, it had now as members representatives of power supply organisations in 15 countries, representing many million kilowatts of generating plant installed. In matters of statistics in various countries and in questions relating to exchange of power between nations the influence of the Union was already of importance.

The principal countries taking part were France, with over 200 participants, Italy 15, Belgium 27, Poland 13, and Czecho-Slovakia 13. The United States was represented by Mr. John W. Lieb, delegated by the National Electric Light Association, which is affiliated to the Union. There were also representatives of Spain, Japan, Holland, Rumania, and Switzerland; the only official British representative was Mr. C. le Maistre, secretary of the International Electrotechnical Commission; at the last moment the British Government was unable to send a representative.

Photo by] [*Ed. Ribaud, Paris.*

The President, Mr. Ponti (Power Organiser for Italy) is holding a roll of papers; Mr. J. W. Lieb is on his left

Some Members of the Union Internationale.

The first group of reports was on the subject of large thermal stations. Mr. Orengo, who was responsible for the central station at Comines, and was one of the pioneers in France of pulverised fuel, in an interesting report gave reasons why French engineers had hesitated to use very high pressures and temperatures in the same way that some engineers had done in the United States, England, and Germany; he urged that the thing that mattered was not thermal efficiency alone, but the all-round balance after allowing for capital charges and anticipated annual load factor. He took a specific case with designs current in 1920 of 1,500-r.p.m., low-pressure, single-cylinder, 20,000-kW turbine units, and compared the results with 1927 designs, 3,000-r.p.m., 2-cylinder turbines at a slightly higher pressure and temperature, and a third with 40 to 45 kg. per sq. cm. (600 lb. per sq. inch) and 425 to 450 degs. C., also at 3,000 r.p.m., and showed that for the case in question the higher pressure only begun to tell after 6,000 hours of operation per annum. He mentioned that in France outside the Paris area the limit of size of central stations was one to take a continuous load of about 62,000 kW with a peak of 73,000 kW. This was followed by a report by Signor Dalla Verde on the steam stations that were being put up or enlarged in Italy at Naples, Leghorn, Mestre, Turbigo, Genoa, Rome, Turin, Cagliari, Catania, and Piacenza, to fill up gaps at times of low water in the mountains and to act as stand-by, only about 5 per cent. of the power in that country coming from steam. From the figures given of ascertained or guaranteed efficiency it would be difficult to pick out which were the largest stations, although with a stand-by station the study of capital charges is all-important. The last paper of the group dealt with a new steam station at Naples.

A series of reports on earthen and masonry dams followed; it was pointed out that there were many obscurities relating to stresses in dams and that recent accidents were due to certain well-known factors. Mr. Mesnager, the well-known expert on armoured concrete, stated that experimental work was being carried out with plaster models with mercury as the testing liquid, its density enabling the size of the models to be greatly reduced. It was stated at the meeting that the French War Office had placed at the disposal of the Ponts et Chaussees experimental section of the Public Works Ministry a quantity of mercury from the munitions reserve to enable tests to be carried out. The French Government was anxious that an international body should be formed to collect information about dams, a matter that affected, not merely electrical power authorities, but also through water supply, irrigation, &c., the public in general and also the farmer. The Union promised to assist in this direction.

A report was given by Mr. Arrighi de Cassanova on flue dust. It was pointed out that the problem was not so much a question of sticky tarry smoke as formerly, but of fine ash drawn up by induced draught from various stokers and the problem of fine dust with pulverised fuel. Centrifugal separators, wet screen separators, and the problem of corrosive acids derived from sulphur in the coal, electric precipitators and the disposal of the dust obtained were dealt with; the last seems to be a matter of great difficulty. The use of tarry liquids instead of water for screen systems was mentioned.

On Thursday a report was given by Mr. M. Uytborck on the security of service based on a detailed questionnaire. This dealt with emergency staff use in case of breakdown, the telephone service, interconnection of central stations, the replacement under tension of circuits after a breakdown, reserves of plant, the working on open or closed networks, safety appliances, and the inspection of lines, sub-stations, &c. The important problems of the earthing of the neutral of high- and of low-pressure circuits were then dealt with; it was obvious that except for what might be termed genuinely extra-high transmission pressures of about 60,000 volts and upwards, there was considerable divergence of opinion; there is also question as to where earthing ought to take place.

One point which came up in the discussion was that of the stealing of electricity by small power users when the neutral is earthed and the power current metered on two phases only, a matter that is often very difficult to detect. Mr. Emile Duguesne, of Brussels, said that in Belgium, to discourage such practices, magistrates were sending the wrong-doers to prison without the option of a fine.

The manager of one undertaking informed our correspondent that he did not earth the neutrals of the low-pressure circuits, either direct-current or three-phase, and never had any difficulty; apparently in Germany it is not usual to earth the neutral of high-pressure distribution circuits.

On Friday afternoon, July 6th, reports were presented regarding the control of installations on customers' premises and on pressure limits for pin insulators and underground cables.

In the latter category certain mechanical inconveniences due to the use of pin insulators were pointed out; each type was compared, and two tables were given of a number of lines in France at from 55 kV to 70 kV with pin insulators. Also a table showing that on a line of 110 kV with neutral to earth pin insulators were in use in Spain, and that some pin lines elsewhere were being gradually replaced by chains. There was a tendency to use chain insulators for lower voltages, despite the increased cost, and also to use pin insulators for straight runs and chain insulators for angles and anchorages.

When dealing with underground cables metallised cables were recommended for use above 15 kV, also single cables when approaching 60 kV, and while the construction of 150-kV cables was to be expected shortly the use of cables for alternating current was limited to short lengths, for example, the urban terminals of overhead lines. The economic limits for cable transmission at 130 kV and 50 cycles were discussed with explanatory diagrams.

The Union Electrique Company, which supplies areas around Paris, has 234 km. (145 miles) of 60-kV feeders formed of single lead-sheathed cables, which have given satisfaction.

On Saturday, July 7th, visits were made by one section of the members to the power stations of Gennevilliers and Saint Ouen, while another group visited the Ampère laboratory of the Compagnie Electro-Ciramique at Ivvy Port and saw some interesting demonstrations at a million volts. The party then visited a new station of the Cie. de l'Electricité de la Seine, built to supply part of the power required by the Metropolitan Railway. Alongside this station is an armoured concrete suspension bridge built across the Seine by the city of Paris to carry the connecting cables from the new station, also 60,000-volt ring mains of the two big power companies, and connections to the sub-station which will be arranged in the future to supply to Paris the surplus power from large water-power stations now under construction on the south-central plateau. Some notes on the above station will be given later.

Two reports on applications of electricity were presented, one by Mr. Waeber, of Switzerland, who stressed the use of electric power for refrigeration for dairy farmers and for the production of heat; in the essentially agricultural area served by the Freibourg Company, with a population of 210,000, in 1926 there were 22,735 sets of apparatus for the production of heat or cold with an installed output of 14,517 kW, and in 1927 thousands more sets of apparatus were connected up.

Mr. M. Koechlin, of the Upper Rhine Company of Alsace, dealt with domestic refrigerating plant and the relative efficiency in watts absorbed per unit of cooling of different types, a matter of considerable importance at home since the regulations were put into force limiting the use of preservatives in foodstuffs. A report of Mr. Ferand, of the Nord-Est Parisian Company, shows that French engineers are beginning to tread the same path that many English engineers did some years ago regarding the adoption of 230/400 volts. There seems to be a question whether in certain damp situations it would not be advisable to adopt transformers for 230 to 30 volts.

Some discussion took place on the Saturday afternoon, on reports on the paralleling of central stations, on a general report of Mr. Ferrerio, of the Italian Edison Company of Milan, special reports on the linking-up of certain stations in the Valenciennes area by Mr. Haveau, and on a more general examination of the problem by Mr. Decry, of the "Loire et Centre" Company. It was pointed out that the linking-up of blast furnace power stations in the Briey iron-ore area with a large network had not given rise to the difficulties at first anticipated, while opinions were given also regarding the difficulty of arranging matters when private concerns sold their by-product power and arranged the running of their stations primarily for their own internal requirements. The question of wattless current figured a good deal in the discussions, it being urged that large consumers should furnish their own.

Mr. Meyer, of the Strasburg Electricity Supply Authority, reported on propaganda among consumers; he pointed out that it was not enough to wait for the results of efforts of wiring contractors to educate the public, it was most important to get into direct touch with the public, although some contractors were nervous if supply authorities did anything material in that direction. The elements and organisation of a campaign were outlined, as well as the uses of the local Press, the kinema, and demonstrations in villages, and the concentration on certain classes of apparatus, one by one, was recommended. Tables were given showing the results of special campaigns regarding night heating of water, and other forms of night utilisation, including industrial drying, also results regarding cooking and lighting in kitchens, shops, and workshops.

A report regarding Switzerland, by Mr. Burri, of Zurich, contained interesting notes on the use of the kinema, radio, and pamphlets, and details regarding progress among different classes of consumers.

Messrs. Emile Brylinski and Selmo dealt with the difficult problem of interference of power lines with those of telecommunication; the former outlined the steps which were being taken by an international commission with members representative of governments interested in international communication. The difficulties were chiefly with high-voltage transmission lines through induction; there were cases of acoustic shock whereby members of the Post Office personnel had been incapacitated for several weeks, and some cases of fatalities through induction. There were some thousands of kilometres of roadside distribution lines at 10,000 and 15,000 volts, and the question of possible interference in such cases was most important.

Paris Conference.

On Monday, July 9th, an inspection was made of five light cars used by the Nord Lumiè Company (dealing with an area north of Paris) for demonstrating the use of apparatus in the houses of the company's clients. A car is sent to a potential customer, and hot plates, irons, suction cleaners, and the like demonstrated on the spot, and in many cases sold there and then. There were also two large lorries, each about the size of a pantechnicon van, hauled by a tractor. One carries farm equipment, the other domestic equipment. They go from village to village and stop several days at some central point, demonstrating on the spot.

The question of statistics was dealt with in reports presented on July 10th. Two points were of special interest: one was that statistics should be useful and not be made a mere means of livelihood, and the other that the inclusion of data relating to private electrochemical and similar industries, including their whole output when they only sold a fraction outside, led to undesirable complications. There is no doubt that in some countries the collection of statistics is greatly abused.

A general descriptive report, prepared by the Société pour le development des Vehicules Electriques, was given on accumulator trucks and tractors in factories, workshops, railway stations and docks. Mr. Lieb presented a film showing a number of motor trucks in use in the city of New York, and also some propaganda film diagrams showing how they are charged and the working of the truck control. Electric trucks and tractors are used in many large French railway stations.

A booklet on "The Problem of Resuscitation from Electrical and Other Accidents in the United States and Canada," by Messrs. C. K. and P. Drinker, of Harvard School of Public Health, was presented at the Congress by Mr. John W. Lieb. Investigation at Yale University tended to show that apparatus giving artificial respiration by positive pressure and suction might often do actual harm. Several committees are co-operating regarding the effect of electric shock on respiratory organs and on the heart. The prone method of artificial respiration is recommended. The New York Edison and affiliated companies' employés connected with constructional and operating work are given instruction three times a year, the clerical and general employés twice a year, and the executive once a year. The classes are of one hour each, with 15 to 20; in 1927 2,150 classes were held.

Education regarding the elimination of risks is also being given; by this means the number of accidents and the time lost through them have been greatly reduced, and during the year ended May 1st, 1928, there were no electric shock fatalities to employés of the Edison group of companies. In the years 1923 and 1924 nearly a thousand deaths took place each year, apart from those due to lightning.

At the first meeting of the conference it was announced that arrangements had been made for the formation of an international organisation for the study of large dams; five Governments had already signified their intention to support the movement. The Society would have the support of the Comité Française des Grands Barrages; Mr. Ponti, of the Hydro-Electric Group of Power Companies of Piedmont, would be the first president, and Mr. Gentiale the secretary. The French Government had agreed to lend to the Office Nationale des Recherches (National Testing Laboratory) at Belleville 20 tons, over a million francs' worth, of mercury to enable tests with model dams to be carried out.

Taken as a whole, the reports presented to the Congress were in a way directed rather to organisation and control and less purely technical than at Rome two years ago. A difficulty was the late arrival of a number of the printed reports, due to late presentation in many cases, which meant that more time than would otherwise have been necessary was spent in abstracting reports. The time available for discussion was in some cases, therefore, too limited.

It was stated at the final meeting that in future each individual general and particular report would be printed separately, so that the lateness of any one report would not hold up the whole section.

The companies in and around Paris and the different propaganda societies made great efforts to explain their publicity methods; much of the printed matter had the humorous touch that would make the central idea easier of retention.

Deputation to Mr. Doumergue.

On Friday, July 6th, the President of the Republic, Mr. Doumergue, received Mr. Ponti and a deputation of the Union in his study at the Elysée; the nature and policy of the Union were explained to him by Mr. Cahen. The President said he was glad to hear that the Union not merely held congresses, but also collected and circulated useful information to its members in different countries at other times. Electricity had become a most important factor in the social life of nations,

and the general progress that had been made in the transmission of power in the last 25 years even in his own home district was marvellous; before long the transport of power between different countries might well become a matter of great importance. He said that the growth of a great social benefit was often accompanied by difficulties in other directions (alluding to trouble sometimes experienced with communication circuits through the operation of transmission lines at very high pressures), but he was confident that engineers would be able to find solutions for such problems.

The President's remarks showed that he had a thorough grasp of the fundamental questions relative to electricity supply.

The remarks of Mr. André Tardieu, Minister of Public Works, on the previous day, and the presence at the Congress of five delegates from his ministry, including Mr. Grimpret, a Privy Councillor, Director of the Hydraulic and General Power Transmission Wayleaves Department; Mr. Armand, President of the Government Electricity Committee, and Mr. Ourson, permanent secretary of the same Committee, an engineer-in-chief of the Ponts et Chaussées, and of two delegates from the Ministry of Agriculture, including Mr. Préand, the Inspector General of the Corps of Rural Engineers (who is responsible for the proper expenditure of funds and loans for rural electrification provided by that ministry), showed that the French Government as a whole realises the importance of electricity supply and is continuing and completing that policy which since 1906 has done so much to bring electricity to the door of the villager.

(To be continued.)

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Lubrication Method.

The accompanying illustration, fig. 1, depicts the method adopted by the A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1, for the lubrication of its recently issued electric fans. The arrangement is self-explanatory, and the following are the chief points claimed for the method: no leakage; breakage impossible; no replacement necessary; and the fan may be run in any position.

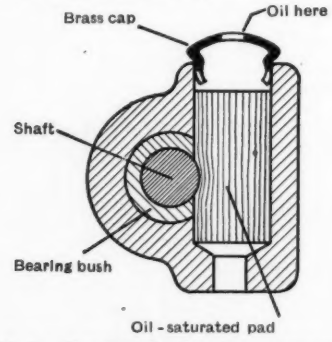


Fig. 1.—Fan Lubrication Arrangements.

A New Thermostat.

We have received from Messrs. GEORGE NOBBS, LTD., 87-89, Cleveland Street, W.1, a sample of their latest production, the "Genii Maclaren" thermostat switch, which is designed particularly for domestic electric hot-water apparatus. It is of simple construction, with few moving parts, and consists essentially of an expanding metal sleeve, a s.p. mercury tube switch, with thumbscrew adjustment, and a graduated dial, all mounted together as one unit and fitted with a spring clip to hold it in position with the sleeve in a protection tube, and also to enable the thermostat to be inserted or withdrawn instantly without drawing off any water. The arrangement is depicted in fig. 2. The one type is adjustable so that it can be used in any position in the sides, top or bottom of the tank, even in a canting position. The apparatus is fitted with an adjustable temperature regulator graduated from 100 to 200 deg. F. The mercury switch is fitted with a ceramic liner to withstand the flash at the breaking of the electrical circuit, thus prolonging the life of the tube. A special glass is used for the mercury switch, the elasticity of which, it is claimed, is such as to prevent the penetration of air, even at high temperatures.

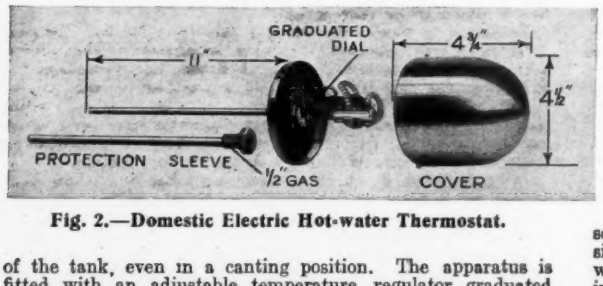


Fig. 2.—Domestic Electric Hot-water Thermostat.

A Lamp Cabinet.

The accompanying illustration, fig. 3, is of a useful cabinet which has been produced by Messrs. SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4, for the purpose of stocking the different types of Siemens automobile lamps. The usefulness of such a cabinet to garage proprietors and all resalers of automobile lamps is apparent. The shelves accommodate the different size cartons containing headlight, side, tail and dashboard lamps in a neat and convenient form, and the accommodation is so arranged that the cabinet contains an assortment of lamps sufficient to supply most needs. In addition, for the assistance of the trade, a printed schedule showing particulars of the various types of lamps required for the cars more commonly in use is placed in a prominent position on the inside of one of the doors. A larger cabinet to accommodate a bigger stock of lamps will be available at an early date.

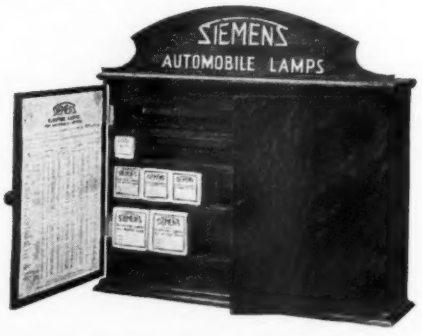


Fig. 3.—Automobile Lamp Cabinet.

A New Connector Box.

A recent development of the ST. HELENS CABLE & RUBBER CO., LTD., Slough, is the "St. Helens" connector box shown in fig. 4. It is designed for use on wiring installations using c.t.s. cable. The box is moulded from a non-hygroscopic, flame-proof material, and is fitted with a highly polished cover. The base has insulating dividing partitions between the terminals. The fixing is provided by means of only one wood screw. Provision is made in the cover for the entry of various sizes of cable by means of recesses on the inside of the cover, which can be neatly cut out. The terminals are firmly moulded in the base, and will take, if necessary, four 3/.036 cables.

Fig. 4.—"Non-Metallic" Connector Box.

"Alumalite" Fire-proof Eye Shade.

A physician whose attention was drawn to the number of cases of serious burning or injury through the use of pyroxylin eye shades has invented a non-inflammable visor styled "Alumalite." These visors can be washed or sterilised, and are exceptionally light (weighing less than ½ oz.), so that they are comfortable to wear. They are said to be especially suitable for welders, kinematograph operators, and others working with the electric arc. The makers are Messrs. S. E. KNOWLES AND COMPANY, 977, Howard Street, San Francisco, Cal., U.S.A.

An Immersion Heater Unit.

A recent introduction of Messrs. CHARLES JOYNER & Co., Icknield Square, Birmingham, is a range of J24 "Angelus" electric immersion heaters, which is said to embody probably the largest unit of its type being manufactured at the present time. Each unit is built upon a bronze base, into which standard "Angelus" immersion heaters are fitted. Each heater is connected from bus-bars of ample cross sectional area. The main connections are cast into the bus-bars themselves, and are held in position by a series of set screws. Particular interest is attached to the heater by the patented method in which the three-heat control is obtained off each heater. The control switch is plugged into a bus-bar system, thus eliminating any intermediate wiring between the switch and the bus-bars. The plug-and-socket arrangements have been carefully arranged, the contact being of ample cross sectional area. Each switch is self-aligning and ingeniously arranged by spring washers. Another important feature is that the elements can be replaced by merely unfastening two screws which secure the circular plate at the top of the heater; this allows the interior to be withdrawn. The heaters are supplied in various sizes with loadings ranging from .25 to 10 kW.

An "Intelligent" Overhead-line Clamp.

It has always been considered of extreme importance that suspension clamps used to support overhead electric line wires should hold on to the wires securely, but a novel feature of a clamp which is made by the American WESTINGHOUSE ELECTRIC & MANUFACTURING CO. is that it knows when to let go. A broken wire easily slips through, thus relieving the unbalanced strain and saving the pole or tower from being pulled over.

The Production of H.P. Cables.

A new method of determining the conditions during drying and impregnation operations.

DR. P. JUNIUS, of Hanover, in an article in a recent issue of *E.T.Z.*, the manufacture of high-pressure cables, outlines a plan whereby the condition of the cable can be checked by electrical measurement at any time during the drying and impregnating operations. The measurements for the maximum degree of accuracy can best be made with a bridge devised by Mr. K. W. Wagner and with medium-frequency alternating current. Fig. 1 depicts

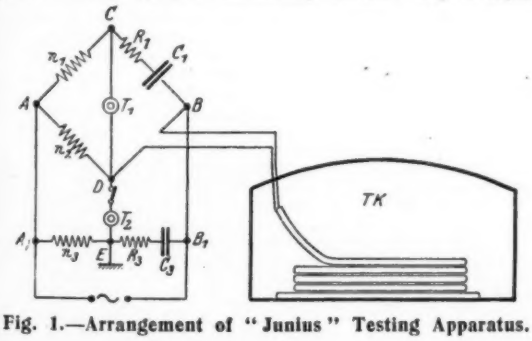
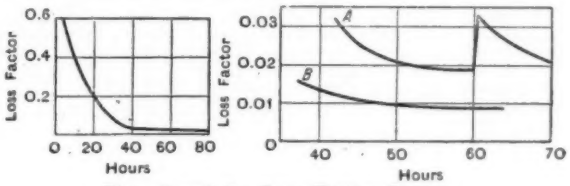


Fig. 1.—Arrangement of "Junius" Testing Apparatus.

diagrammatically the arrangement adopted. The cable in the drying and impregnating chamber TK is connected electrically to a Wagner bridge. Attention must be paid to the protection of the conductors, the earthing of the apparatus, and to the insulation of the cable from the drying chamber. Moreover, in the case of a Höchstadter cable, it is necessary to connect the outer metal sheathing with the point D on the bridge. In practice it has been found that the cable can be sufficiently insulated from earth by fitting the interior walls and bottom of the drying chamber with wooden blocks.

The method has given very satisfactory results in practice. It was first tried in conjunction with a 930-yard length of 30,000-V three-conductor cable. In fig. 2 is a curve showing the reduction in the loss factor during the drying operation, the fall being from 0.6 to 0.008 in a period of 80 hours, the temperature and air pressure in the chamber being constant during the whole period. The necessity for the latter is indicated by fig. 3, which embraces the curves obtained in two different drying tests. The unusual feature of curve A caused inquiries to be made, as a result of which it was found that the workman in charge had opened the drying chamber in order to insert an omitted maximum thermometer. The incident was, however, useful in that it showed that even during a very brief opening of the chamber sufficient moisture was admitted to the interior to necessitate a ten-hour extension of the drying operation. Fig. 3 is also interesting as indicating how different from the point of view of moisture two distinct cables can be. Fig. 4 shows the curves of the capacity increase of two cables during impregnation. As will be seen, this steadily rises until a point is reached when the paper layers cannot absorb, at the predetermined temperature,



Figs. 2 and 3.—Loss Factor Curves.

any further oil. Thus, the test clearly shows the time when, although the cable cannot be removed from the chamber until it has cooled off, it is no longer necessary to inject impregnating oil.

Dr. Junius claims that the method he has devised and for which application has been made for a patent, will prove of

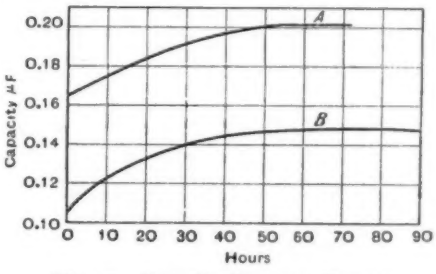


Fig. 4.—Capacity Increase Curves.

material assistance in the production of high-quality and high-resistance cables, and that it provides a more rational system of manufacture than under the unreliable and costly testing method hitherto employed.

Polishing & Plating Plant.

Some hints on the installation and maintenance of electrical driving equipment.

AT the May meeting of the Electroplaters' and Depositors' Technical Society held at the Northampton Polytechnic Institute in London, a very practical paper was read by Mr. J. W. Perring on "Notes on Polishing and Plating Plant." Mr. Perring said that the machinery in the polishing shop was usually of a simple character, comprising polishing spindles, line shafting, and driving motor. The spindle ends usually consisted of conical vee or buttress threads, cut in such a direction that the tools tended to tighten when pressure was applied to them. The power required was dependent on the class of work in hand, a good figure for a general shop being about 1 h.p. per spindle-end, i.e., 2 h.p. per polishing spindle, and the best position for the driving motor was in a room adjoining. If this was not possible the motor could be covered by a movable box of liberal size, fitted with doors to give access to the motor without moving the box. In a high shop motors could be fixed overhead, or, if this was not possible, near to some wall or partition, with the belt running close to the wall; this method was the most economical of space. In any case, the starting switch should be in the polishing shop, and easily accessible. The ideal spindle motor was probably of the three-phase type, with an indestructible rotor, which could be switched straight on to the line by a simple triple-pole switch, giving minimum size with maximum simplicity and robustness. The spindle motor came into its own where only one was required, and no shafting was available.

In the plating shop all the modern generators were now fitted with copper graphite brushes. Direct coupling to a suitable motor was the most convenient form of driving, and where a d.c. supply was available this should be used for field excitation. In the case of large machines, even where d.c. was not available, a small d.c. generator could be coupled to the set for excitation. This method gave much better voltage regulation, and with a suitable field resistance a very fine voltage adjustment could be made. It was important to note that the field circuit should never be broken when current was flowing unless special precautions were taken; the field windings being highly inductive, a very high voltage was induced in the windings on suddenly stopping the current, eventually

breaking down the insulation of the field coils. If the field circuit was required to be broken, this could be done with safety by means of a special field-breaking switch, connecting a suitable non-inductive resistance across the field at the moment of breaking. A simpler method was to connect the non-inductive resistance permanently across the field; the circuit could then be broken by means of an ordinary switch, preferably double-pole. This method had the disadvantage that the resistance was always in circuit when the machine was running. The machine could be connected directly to the anode and cathode rods, *via* an ammeter or its shunt, without any series resistance. A very fine control could be obtained by means of the field resistance, which could have as many studs as required.

The best connection for the field winding was across the motor armature terminals in the case of a d.c. set; in the case of an a.c. set it would, of course, be connected across the exciter terminals.

When variation from zero to maximum was not necessary, but the voltage across bath was required to be at or near zero while putting in work, the field-breaking switch in combination with a suitable resistance was useful. The resistance could be left set to the required current. On closing the field-breaking switch the current would come up to maximum without undue shock to the machine due to the time taken for the field current to reach the maximum. Where batteries were charged by the generators some form of reverse protection was necessary, as in the event of the motor stopping through failure of the supply or fuse blowing, the batteries would be across the generator armature with little or no field, and something had got to go; most probably the risers would become unsoldered. A convenient form of protection was an ordinary high-voltage circuit breaker fitted with overload and no-volt trips. The no-volt trip should be set to operate at a voltage under that of the supply, but as near to it as convenient for reliable operation, the no-volt coil being connected across the motor terminals and the breaker between the cells and the generator. That arrangement allowed the cells to be floated across the generator. Some forms of reverse protection would not permit of this as they operated as soon as current flowed from the cells. In cases where one vat required a current of 500 A, or over, it was convenient to provide it with a machine to itself and take advantage of field regulation.

The bus-bars were usually round copper rods supported on suitable insulators (mining cleats were convenient); above 1 in. diameter the rods became unwieldy, and strip was more convenient, either solid or laminated. Solid strip or bar, say 2 in. by ¼ in., for 1,000 A, was convenient; the lamina being 3 in. by ¼ in., or 2 in. by ¼ in., a number of these could be made up with ¼ in. air spaces to form a bus-bar of the cross-sectional area required. The spacing would be formed by the joints, and the angles and tees by interleaving the ends for a distance equal to the width of the strips and clamping by two square cast-iron plates and four bolts. This could be added to or decreased at any time; also the contact surface at the joints was many times that given by joining two round rods, or solid strips, or bars. This method was much used in heavy switchboard work.

For small shops where round rod was used, tee connections for vats could be taken off by means of clamps formed by two pieces of brass bar (in case of ½ in. rod, say 1 in. by ¼ in.) one plate being left longer than the other for the tee connections. The plates were clamped by means of two bolts, a hole the size of the copper rod being bored with the joint at its centre between the bolts and at right angles to the length of the bars. The runs to the vats could be made in strip, say, 1 in. by ¼ in. or 1 in. by 3/16th in.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

Lighting Installations.

A fatal accident which recently took place brought to light an old failing on the part of electrical contractors, *i.e.*, the *connecting* of s.p. tumbler switches to the wrong pole of the supply mains, "the neutral."

Where a 3-wire d.c., or 4-wire a.c., supply is connected to any lighting installation, it is necessary that the supply of cables should be so connected that the switches are on the live side. I consider the supply company, or corporation, should make the necessary tests to insure this is done. The contractor who does the installing should help by insisting that all switches are connected on what will be the live side of the system. It is lamentable to think that lives are lost through lack of care, and the electrical contractors can in many cases avoid bringing electricity into disrepute by exercising this necessary care. There is no doubt that if a lighting installation has the switches on the correct pole, insulated switches are used where there is a stone or conducting floor, there will be practically no danger to the life of anyone handling lampholders or switches.

Another matter which should have the attention of contractors is the installing, as in several cases I have seen, of 2-pole or 3-pole switches which are too small to cope with the load they have to carry. In one case a 3-pole, 15-amp. switch had been installed to control a 14-h.p., a.c., 3-phase, squirrel-cage motor, star-delta starting. The result was overheating of the switch blades and contacts, and ultimately intermittent 2-phase running of the motor, which, fortunately, was noticed in time to avoid a burn out. In another case a 60-amp. switch-fuse was installed as a main switch controlling motors which totalled 30 h.p. full load and 50 amps.

It appears that the starting current taken by a.c. motors, which at times is as much as from 2 to 300 per cent. more than the nominal full-load current, is overlooked, with the inevitable result of overheating of the switch contacts, and eventually a burn out of the switch, or at times the motor, takes place.

A few shillings more spent on switchgear, of the right capacity, saves pounds worth of trouble to the owners, and the name of the contractors.

Switchgear.

July 21st, 1928.

Earthing and the Public.

With further reference to my letter in your issue of the 20th inst., I quite see now that it is rather impossible to enforce the use of a 3-pin plug. However, it is not encouraging the use of earthed gear when practically every kettle, iron and vacuum cleaner is sold ready fitted with a lampholder plug, and may I state that before any kitchen-range-boiler which is used in connection with a public water supply is allowed to be connected to the mains, it *must* be fitted with an expansion tank. This takes the form of the full-value storage tank, and is situated at the extreme top of the installation above the boiler and cistern. This tank acts as, and takes the form of, a safety valve.

Noel S. Byers.

Manchester, *July 21st*, 1928.

Tapping the Single-phase Meter.

It will probably interest Mr. J. G. H. Bowie to know that a well-known Continental firm of electricity meter manufacturers produced some 18 months or two years ago a single-phase meter embodying a tapping in the current coil, as outlined by him in his letter in your April 6th, 1928, issue, the ratio of the tapped portion to the whole of the coil being equal to the ratio of the o.a. (other apparatus) tariff to the lighting tariff. This means that the lighting circuit would be connected with the whole of the coil in circuit, whilst the o.a. circuit would be connected so that only the tapped portion of the coil would be in series, the beginning of the coil being common to both circuits. The meter, of course, would not register kelvins, but only "units," the monetary value of the unit being equal to the lighting tariff.

The scheme would seem desirable except that it has a decided weakness, *i.e.*, possibility of fraud by the consumer. It is obvious that the consumer has available two wires direct from the meter series coil (the other being sealed into the service run) and fraud is possible by short-circuiting these wires between the meter and the lamps, whereby it is possible to take part of the lighting current through the o.a. portion of the series coil only, thus obtaining light at reduced rates. On alternating-current circuits the fraud obtained by the short-circuit would be further assisted by a comparatively heavy transformer current which would flow through the short-circuit, the current element of the meter acting as an auto-transformer. This current would be in phase opposition to the main current, and would reduce the flux in the series magnetic circuit, which would create a serious error. The possibility of the consumer unwittingly defrauding the supply authority by means of an unknown short-circuit is obvious.

L. F. Mullett,

(*Meter Dept.*, ADELAIDE ELECTRIC SUPPLY CO., LTD.)

Adelaide, South Australia, *June 6th*, 1928.

"Selected" and "Non-Selected" Stations.

With the inauguration of the national scheme the question is frequently asked, "What advantages have the owners of 'selected' stations over owners of 'non-selected' stations?" The wording of the Act does not clearly set out the differences, and engineers do not seem to be by any means unanimous in their views. It would be very instructive if we could have, through your columns, the opinions of engineers who have gone carefully into this matter. Personally, I should greatly value any information clearly describing the respective merits of "selected" and "non-selected" stations, both from the financial and legal points of view.

City Electrical Engineer.

July 21st, 1928.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

Private Bills.

The Shropshire, Worcestershire and Staffordshire Electric Power Bill has been read a third time in the House of Lords, and the North Metropolitan Electric Power Supply (Consolidation) Bill has been read a second time in the House of Lords.

The Nottinghamshire and Derbyshire Tramways (Trolley Vehicles, &c.) Bill was read a third time in the House of Commons on July 23rd.

Special Orders.

The Chasetown and District Electricity Order, 1928, the Tisbury Electricity Order, 1928, the Clitheroe and District Electricity (Extension) Order, 1928, and the New Sarum Electricity (Extension) Order, 1928, have been approved.

Patent Applications.

On July 18th, Mr. WILLIAMS informed Mr. Malone that the number of complete specifications filed in connection with applications for patents and awaiting first action by the Examiner was about 6,300; during the present year those arrears had accumulated at an average rate of about 67 per week; the number of complete specifications filed in the first half of 1912 was 9,313, and in the corresponding period of 1928, 11,751. Steps had been taken to increase the examining staff, to deal with the additional work.

Transmission Line Poles.

On July 19th, Lt.-Col. ACLAND-TROYTE asked the Minister of Transport whether, in place of the large and unsightly poles made of foreign timber used for carrying electric cables, he would consider the employment of smaller and less conspicuous standards made of English iron.

Col. ASHLEY said that the provisions as to the minimum height of electric lines above ground and as to factors of safety, prescribed by the Overhead Line Regulations of the Electricity Commissioners, necessarily governed both the length and diameter of the poles or other supports which could be used. The regulations permitted of the use of poles made of iron, steel or reinforced concrete, as well as of wood, and in the generality of cases the choice of material to be used was a matter for the discretion of the supply authority.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1927.

5,844. "Electric switches for signalling purposes." A. L. Davis. March 2nd, 1927. (293,074.)

7,427. "Switchgear for the charging of electrical accumulators." C. M. Anderson. March 17th, 1927. (293,079.)

7,922. "Electrical relays or the like apparatus." General Electric Co., Ltd., A. E. Angold and W. Wilson. March 22nd, 1927. (293,082.)

7,962. "Electromagnetic relays or indicating instruments." General Electric Co., Ltd., and A. E. Angold. March 22nd, 1927. (293,083.)

8,288. "Manufacture of accumulator grids." W. Haddon, W. Haddon, and W. J. Robertson. March 25th, 1927. (293,089.)

8,369. "Apparatus for selecting the luminous points of an image for reproduction by television." E. J. Brun. March 26th, 1927. (293,093.)

8,407. "Electrodeposition of rubber from latex or the like." W. A. Williams. March 28th, 1927. (293,095.)

8,464. "Magnetic-core materials and their manufacture." Standard Telephones & Cables, Ltd. April 17th, 1926. (269,510.)

8,465. "Magnetic materials and methods of producing the same." Standard Telephones & Cables, Ltd. April 17th, 1926. (269,511.)

8,618. "Wireless receiving systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). March 29th, 1927. (293,104.)

8,642. "Control of alternating-current electric motors." L. Miller and Metropolitan-Vickers Electrical Co., Ltd. March 29th, 1927. (293,105.)

8,648. "Electronic or ionic amplifiers, detectors, oscillation generators, and the like." W. S. Smith and N. W. McLachlan. March 29th, 1927. (293,107.)

8,654. "Means for cooling transformer windings." Sir C. A. Parsons and J. Rosen. March 29th, 1927. (293,108.)

8,727. "Electric protective systems and relays therefor." A. Reyrolle and Co., Ltd., B. H. Leeson, E. W. M. Scott, and R. W. Biles. March 30th, 1927. (293,113.)

8,735. "Potential supply means suitable for use in wireless receiving apparatus." B. D. Field and T. C. Standbrook. March 30th, 1927. (Cognate application 20,558/27.) (293,114.)

8,870. "Electric surge absorbers." A. Reyrolle & Co., Ltd., and H. C. Atkins. March 31st, 1927. (293,118.)

8,881. "Electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co.). March 31st, 1927. (293,120.)

8,895. "Apparatus for smoothing unidirectional electric currents." Metropolitan-Vickers Electrical Co., Ltd. March 31st, 1926. (268,797.)

9,024. "Radio receivers and energy supply means therefor." C. S. Agate and W. H. Connell. April 1st, 1927. (293,127.)

9,062. "Electrically-operated sound transmitting, reproducing, or recording devices." M. Trouton and Wireless Music, Ltd. April 1st, 1927. (293,131.)

9,493. "Electric switches." General Electric Co., Ltd., and H. W. B. Gardiner. April 6th, 1927. (293,139.)

9,810. "Electromedical apparatus." S. Cox. April 9th, 1927. (293,141.)

9,916. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and F. P. Whitaker. April 11th, 1927. (293,144.)

11,602. "Time switches for electric circuits." Tyer & Co., Ltd., and F. W. Leake. April 30th, 1927. (293,151.)

12,641. "Floats, battens, and like stage-lighting or like apparatus." T. J. Digby and A. O. Gibbons. May 11th, 1927. (293,159.)

13,128. "Miners' electric safety lamps." Ceag, Ltd., and R. J. Plummer. May 16th, 1927. (293,162.)

13,611. "Insulated rods for suspending conductors or operating switches and the like." H. Beardsall and Metropolitan-Vickers Electrical Co., Ltd. May 20th, 1927. (293,166.)

14,892. "Electric heating devices for warming beds or for other purposes." W. H. Sturge and S. H. H. Barratt. June 7th, 1927. (Cognate application 5,658/28.) (293,177.)

15,101. "Means for protecting insulators for high-tension cables from injury through sparking." F. Berg. June 7th, 1927. (293,184.)

17,914. "Protection of buildings and the like from lightning." Electrical Improvements, Ltd., and L. C. Grant. July 6th, 1927. (293,198.)

17,973. "Magnifiers for telegraph signals." A. I. Kiesel. July 6th, 1927. (293,199.)

18,107. "Loud-speakers and the like instruments." E. V. Mackintosh and C. French (trading as Celestion Radio Co.). July 7th, 1927. (293,200.)

19,691. "Electric circuit interrupters." British Thomson-Houston Co., Ltd. August 16th, 1926. (275,954.)

19,873. "Electric motor, particularly for dental purposes." Siemens-Reiniger Veifa Ges. für Medizinische Technik. August 10th, 1926. (275,961.)

20,769. "Suspension of the live wire of electric railways." F. Berg. August 6th, 1927. (293,213.)

21,370. "Method of reducing the interfering influences upon telephone and telegraph systems from currents of high frequencies in circuits fed by rectifiers." International General Electric Co., Inc. August 14th, 1926. (276,021.)

24,884. "Electric incandescent lamps intended to be used in series." F. Eckhardt and M. Hohnekamp. September 30th, 1926. (Patent of addition not granted.) (278,348.)

26,089. "Cooling means for dynamo-electric machines." W. R. Uggla. January 17th, 1927. (283,846.)

26,396. "Cord grips for electric or other fittings." A. W. Kimber and H. G. Westlake. October 6th, 1927. (293,240.)

27,088. "Electric interlocking machines for railway signalling." Telefonaktiebolaget L. M. Ericsson. October 14th, 1926. (279,089.)

27,968. "System of connections for preventing the self-excitation in commutator cascades, having a different frequency from that of the network." Akt.-Ges. Brown, Boveri et Cie. November 11th, 1926. (280,516.)

28,230. "Apparatus for combining the effects of a gramophone and a radio receiving set." Igranic Electric Co., Ltd. July 30th, 1927. (293,243.)

29,768. "Electrical remote-control and signalling systems." Siemens Bros. and Co., Ltd., and H. E. Humphries. April 8th, 1927. (Divided application on 280,254.) (293,253.)

31,238. "Repeater systems." Siemens & Halske Akt.-Ges. November 22nd, 1926. (280,957.)

31,502. "Sound-reproducing apparatus." J. A. Law (E. F. Holinger). November 23rd, 1927. (293,254.)

33,115. "Rolling stock of railways, tramways, and road-transport vehicles." P. Algrain. March 25th, 1927. (Addition to 278,337.) (287,541.)

33,829. "Apparatus for producing ultra-violet rays." Hanovia Chemical and Manufacturing Co. August 24th, 1927. (293,257.)

33,840. "Pincers for cable clamps for the chain-suspensions of electric railways." F. Berg. December 14th, 1927. (293,258.)

1928.

2,065. "Spinning machines with electrically individually-driven flyers." Siemens-Schuckertwerke Akt.-Ges. January 22nd, 1927. (283,976.)

3,194. "Electromagnetic friction clutches." P. Forster. February 1st, 1928. (293,277.)

4,013. "Arrangement for regulating electric machines by means of electron tubes." Siemens-Schuckertwerke Akt.-Ges. February 19th, 1927. (285,483.)

5,860. "Welding electrodes." O. Y. Imray (E.M.F. Electric Co. Proprietary, Ltd.). June 28th, 1927. (Divided application on 17,178/27.) (293,283.)

11,489. "Radio and the like receivers." Marconi's Wireless Telegraph Co., Ltd. April 19th, 1927. (289,012.)

11,592. "Electrical insulators." Metropolitan-Vickers Electrical Co., Ltd. April 28th, 1927. (Addition to 195 593.) (289,467.)

15,020. "Telephone cables." Siemens & Halske Akt.-Ges. May 24th, 1927. (291,030.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 18th.

Lewcos. No. 484,401. Class 8. Apparatus for use in radio-telegraphy and telephony.—London Electric Wire & Smiths, Ltd.

Aspiropulsatit. No. 492,400. Class 11. Electrical pulso-massage apparatus for surgical or curative purposes.—Oreste Sinanide, 53, Sloane Street, S.W.1.

David (lettering and design). No. 489,428. Class 13. Electrical fittings and accessories for heating, lighting and cooking appliances, conduits and conduit fittings, &c.—Chesterton, Jones & Co., Ltd., 44-45, Littleton Street, Walsall.

Italian Congress at Geneva.

The 33rd annual Congress of the Italian Electrotechnical Association is to be held in Geneva from September 30th to October 5th next. A number of papers are to be read at the meeting and visits paid to several power stations, and also to the works of the Atlantic Refining Co., of Italy, the Ansaldo Co., and the San Giorgio Co.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Reconstruction of workshops of Asylum for the Blind (£5,000); G. Wilson, chairman of the board.

ABINGDON.—Additional 30 houses for the R.D.C.; surveyor.

ALDERSHOT.—Garage and workshop, for the Aldershot and District Traction Co., Ltd.; Friend & Lloyd, architects, Grosvenor Road.

AYR.—School, Heathfield Road (£19,607), for Ayrshire E.C.; director of education, Ayr.

BALBY (DONCASTER).—Church (£10,000), for the Wesleyan trustees; secretary.

BEDDINGTON (SURREY).—New All Saints' church (£10,000); H. P. Burke Downing, architect.

BEXHILL.—Thirty-eight houses, Sidley Estate; borough engineer.

BISHOPBRIGGS.—Miners' Hall; secretary, Cadder District Miners' Welfare Committee.

BLACKBURN.—Housing scheme (£29,000); borough engineer. School (£36,500), Audley; director of education.

BOLTON.—Reinstatement, after fire, of mill, for Messrs. Blair & Sumner, Ltd.

BOURNEMOUTH.—Alterations, Highcliffe Hotel, St. Michael's Road; Highcliffe Hotel Co., Ltd. Thirty-nine houses, Lower Charminster Road; borough engineer.

BRADFORD.—Gasworks reconstruction (£80,000); gas engineer. Extensions to Alhambra Theatre (£2,000); Wm. Illingworth, architect, 15, Sunbridge Road.

BRIDLINGTON.—Re-erection after fire of premises for Holtby, White & Co., Prospect Street, motor engineers.

BULKINGTON.—Electric light installation, Roman Catholic church, and presbytery, Weston-in-Arden; priest in charge.

BURNHAM.—Police court, station, &c. (£6,600), for Bucks. C.C.; county architect, Aylesbury.

BURNLEY.—Housing scheme (200); borough surveyor.

COVENTRY.—Cinema, Gosford Street; George Coles, architect, 40, Craven Street, London, W.C.

CROYDON.—Re-erection (after fire) of premises for Young, Randall & Co., manufacturing confectioners, 5, Bedford Place, electrically equipped (£45,000).

DAGENHAM (ESSEX).—Houses (225), Eastern Hall Estate, for Ashton & Wade.

DARLINGTON.—Rivet works and reconstruction of factory, Bradshaw, Gass & Hope, architects, Bolton. Houses (50), Geneva Road East, for H. Parvin. Houses (20), Latimer Road, for J. Clayton.

DARTFORD.—Premises, Luton House, High Street, for F. W. Woolworth, Ltd., bazaar proprietors, Kingsway, W.C.2.

DERBY.—Re-erection of warehouse, Stuart Street, for Johnson Bros. (Derby), Ltd. (£10,000).

DONCASTER.—Wesleyan church and schools, Balby (£8,000); A. Brocklehurst & Co., architects, Manchester.

DUMFRIES.—Offices, Sun Inn Close, for Thomas Hunter, Watson & Co., Ltd., *Dumfries and Galloway Standard.*

EASTLEIGH AND BISHOPSTOKE.—Houses (133), for the U.D.C.; M. Venning & Son, builders, Cardiff.

EDINBURGH.—Alterations at Murrayfield Parish Church (£8,000); the minister. Electricity sub-stations at City Hospital Road, Roseburn Drive, and Comely Bank; electrical engineer.

GLASS HOUGHTON.—School extension (£11,000); West Riding Education Committee.

GOOLE.—Extension of the Working-men's Club, Victoria Street; F. Turner, architect, Carlisle Street.

HALIFAX.—Nurses' Home, Royal Infirmary, Walsh and Maddock, architects, 10, Harrison Road.

HASTINGS.—Parish hall for Rev. A. F. Alston; J. B. Mendham, architect. Two halls, for the Salvation Army; O. Archer, architect.

HULL.—Extension of medicated baths; city architect, Guildhall.

INGLETON.—Elementary school (£13,500); West Riding Education Committee.

KEIGHLEY.—Extension, Technical College (£3,600); West Riding Education Committee. Alterations and additions to sewage disposal works, Marley (deposit £10); D. Balfour & Sons, civil engineers, 3, St. Nicholas Buildings, Newcastle-on-Tyne.

KINGSLAND (HEREFORDSHIRE).—Re-erection of saw mills for Messrs. Taylor.

LINCOLN.—Additional 41 houses, for the T.C.; borough surveyor.

LITTLEHAMPTON.—Re-erection (after fire), of dance hall for the U.D.C.; surveyor.

LONDON (ILFORD, E.).—Housing scheme (120), Barkingside, for the T.C.; H. Shaw, borough engineer (returnable deposit of £5 5s.).

(WEST HAM, E.).—Extensions to tramcar depot, Plaistow, for the T.C.; borough engineer (returnable deposit of £1).

(WHITECHAPEL, E.).—Reconstruction fire station (£19,000); L.C.C. architect.

(ST. PANCRAS, N.W.).—Printing factory, Euston Road site; Claremont Haynes & Co.

(CATFORD, S.E.).—160 houses, Woolston and Perry Hill Estate; Tysoe & Harris.

(GREENWICH, S.E.).—Housing scheme (76), Charlton Park, for the T.C.; borough engineer (returnable deposit of £4 4s.).

(PECKHAM, S.E.).—Additions, Hippodrome, High Street; F. T. Verity.

(WOOLWICH, S.E.).—Additional 90 houses (all-electric), Well Hall, Eltham, for the T.C.; borough surveyor. Laundry, Albion Road; Royal Arsenal Co-operative Society, Ltd.

(WANDSWORTH, S.W.).—Extensions, premises of Columbia Gramophone Co., Ltd., Garrett Lane; W. M. Marcus.

(TILBURY, E.).—Baggage hall, &c. (£40,000), for the Port of London Authority; Sir Edwin Cooper, architect, 4, Verulam Buildings, W.C.

LUTON (BEDS.).—Works extensions, S. Hubbard, Ltd., bleachers and dyers, New Street; Adamant Engineering Co., Ltd., Dallow Road; and A. R. Child & Son, Ltd., hat manufacturers, Williamson Street. Gramophone record factory, Chaul End, for the Dominion Record Co., Ltd.; G. R. Hall Caine, chairman. School (£49,859), for the Borough E.C.; Stanley C. Parrott, architect.

MAESYCWMMER.—Secondary school for Glamorganshire E.C.; director of education, Cardiff.

MALDEN (SURREY).—Houses (124), Cromwell Avenue, for Messrs. Watts, Streatham.

MANCHESTER.—New premises, Old Hall Lane, for Manchester Grammar School (deposit £3 3s.); P. S. Worthington & F. Jones, architects, 178, Oxford Road. Tuberculosis clinic, Oxford Road and Denmark Road; City Medical Officer of Health.

MARGATE.—General hospital, with X-ray department; Adams, Holden & Pearson, architects, Knightsbridge, London.

MEXBOROUGH.—Extensions, secondary school (£16,000); West Riding Education Committee.

MYTHOLMROYD (HALIFAX).—Re-erection, after fire, of works, for Thornber Bros. (over £10,000).

NEW OLLERTON (NOTTS.).—Church (£10,000); H. T. Shelton, secretary.

NORMANTON.—Smallpox hospital; District Hospital Board.

NORTHAMPTON.—Additional 60 houses, St. David's Estate, for the T.C.; Alfred Fidler, borough engineer (returnable deposit of £5).

OXTED (SURREY).—Offices (£13,000), for Godstone R.D.C.; surveyor.

PAIGNTON.—Estate development, Totnes Road; T. R. Robinson.

PORTSMOUTH.—Houses (165), for the T.C.; Messrs. Humby, builders. Flats (£6,800), for the T.C.; Tanner Bros., builders.

READING.—Cinema, Russell Street and Oxford Road; H. S. Scott.

RICHMOND (SURREY).—Cinema, shops and flats, Hill Street; Leothart & Granger.

ST. HELENS.—Tramway offices, waiting room and conveniences, Ormskirk Street and Westfield Street; A. W. Bradley, borough and water engineer, Town Hall.

SADDLEWORTH.—School (£10,000); West Riding Education Committee.

SALFORD.—Offices for the Water Department (£3,000), for the T.C.; borough surveyor.

SCAWTHORPE.—Secondary school, for West Riding E.C.; director of education, Wakefield.

SELBY.—Extensions, Art and Technical School (£4,550); West Riding Education Committee.

STOCKTON-ON-TEES.—Housing scheme (158), for the T.C.; borough surveyor.

TILEHURST.—Hospital, Blagrave, for the governors of the Royal Berkshire Hospital; Charles Smith & Son, architects, 164, Friar Street, Reading (returnable deposit of £3 3s.).

TROWBRIDGE.—Cottage hospital extension (£13,176); A. J. Taylor and W. W. Snailum, architects.

WHITEHAVEN.—Housing scheme (42), for the T.C.; borough engineer (returnable deposit of £1 1s.).